for VICTORY ...— Work Harder ...— Stop Waste ...— Buy Bonds

Contractors and Engineers Monthly

Vol. 40, No. 10 OCTOBER, 1943 $2 a Year, 20 Cents a Copy

Highlights Of This Issue

IN THIS ISSUE

C. & E. M. Photo
Good shop equipment aids Wyoming to keep its highway machines in service.

State Repair Shop At Cheyenne, Wyo.

Standard Plans Used for All Shops Doing General Overhaul Service on Road Maintenance Equipment

(*Photo on page 68*)

✦ THE Wyoming State Highway Department equipment repair shop at Cheyenne is similar to the district shops throughout the state, except that the shops for the districts are slightly smaller. The main shop, located in the southwest industrial section of the city, adjacent to the Highway Department laboratory, is an 80 x 120-foot brick building with a flat 50-year-bond Johns-Manville roof. The building is divided

(*Continued on page 18*)

New Ohio Underpass Built Under Difficult Conditions

Treacherous Excavation, Compactness, Rail Traffic Hinder Work on Structure For Access to War Plant

✦ THE new Poth Road underpass in Columbus, Ohio, a concrete-encased steel-beam bridge on a concrete substructure, to provide access to a war plant and to Port Columbus Airport, presented a variety of interesting construction problems, among them the fact that normal railroad traffic during construction averaged 200 trains every 24 hours.

Built to carry three tracks of the Baltimore & Ohio Railroad, on which Pennsylvania Railroad trains also travel, and of sufficient width to accommodate a fourth track in the future, the structure spans two 24-foot lanes of 8-inch bituminous-concrete pavement, supplemented by a subfoundation of 12 to 20 inches of pit-run gravel within the ramp entrance limits of the underpass. Each lane of pavement is bounded by a combined curb and gutter, 30 inches in width, and 5½-foot concrete sidewalks are provided beneath the structure at the outer edges of the pavement.

Preliminary investigation showed some variation in soil conditions to a moderate depth, underlaid with a shale foundation. Due to this fact, it was decided to build the structure in sections, rather than to support the tracks on temporary bents during construction. Because of the existence of Walnut Creek Bridge about 700 feet to the east, any radical relocation of the tracks to allow the structure to be built as a unit was impossible.

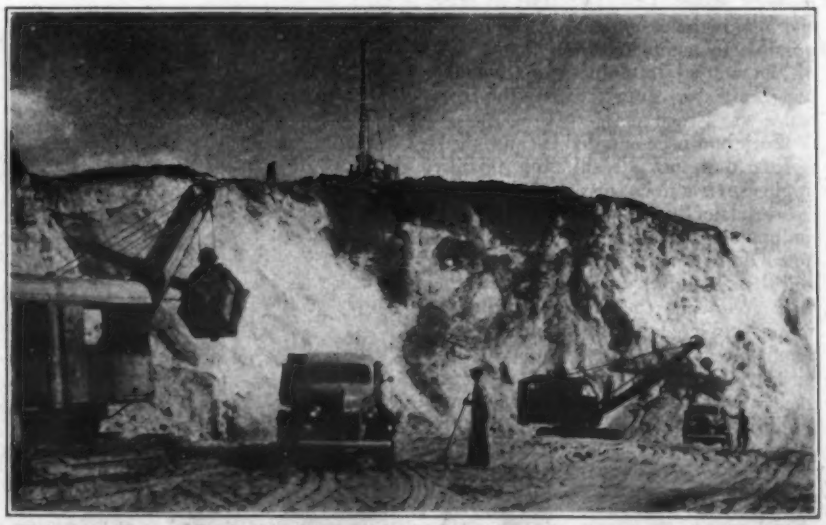
During the installation of a 24-inch reinforced-concrete drainage-outlet pipe from a manhole just north of the structure east to Walnut Creek, the top of the shale strata was found to run at a fairly regular depth of 8 feet below the ground from the creek to within 75 feet of the structure, then dipped at a 45-degree slope toward the structure, reappeared 4½ feet below the pier footing at the north end of the structure, 6 feet below the surface of the ground at 150 feet south of the structure, and on a fairly level plane 12 feet below ground about 300 feet west of the structure. Except at the pier, the shale is at an unknown depth below the footings. Soil studies indicated that the structure sits on an old drainage bed, with deposits of a reddish quicksand, a sharp blue sand, a small amount of white silica sand, and some silt, underlaid with hard pebbly clay which provided a good foundation for the footings.

The plan called for the structure to be built in four sections or stages, Stage 1 being the two north circular wings and a 24-foot width of the deck, abutments and pier; Stage 2, the next 14-foot width of deck, abutments, and pier; Stage 3, the remaining 24-foot section of deck with abutments and pier and about half of the length of the circular wings; and Stage 4, the remaining parts of the wings.

The three tracks were first moved south, by railroad force account, within the structure limits but a sufficient distance to allow the first line of steel sheeting for the cofferdam to be driven with a clearance of 8 feet from the center of the nearest track. This line was only 24 inches from the near edge of the concrete to be placed, and of this space the sheet piles occupied 8 inches and the wales 12 inches, leaving only 4 inches for form work. The sheet piles were driven 18 feet below ground, except where excavation was to be deeper for the abutments and pier. At these points, the depth was increased to 25 feet. It was intended that cross "entries" would be excavated at the pier and abutments, with 12 x 12 oak wales at the wall, and diagonal braces from the wales along each side of each "entry" to pad the foundations against suitable soil, with such incidental wood sheets as might be required at the sides

(*Continued on page 7*)

SAND FOR STABILIZED SUBGRADE



Halvorsen Bros. of Rochester, Minn., took 50,000 cubic yards of sand out of this pit for a job which is to be duplicated many times in Minnesota's post-war highway program. Two Speeder shovels loading trucks are shown, with a Bucyrus-Armstrong well drill working on a rock outcrop. See page 31.

Post-War Prospects

Fields of Communications, Engineering And Research Are Important to Future

Telephony and Telegraphy, Radio and Television with Electronics Offer Promise Of Aids to Construction

✦ IN the field of communications—telephony, telegraphy, radio, television, and electronics—there are bound to be vast post-war developments, but few of these will directly involve the construction industry other than some industrial buildings, the required towers for transmission and reception in radio and television, and probably a greater volume of specialized work in the placing of cables below ground for protection and safety. However, many new developments in this field will have an impact heretofore unthought of on the management and operation of construction projects.

Telephony

Almost anything can be expected in the extension of telephone lines after one has read the report from the headquarters of the Northwest Service Command at Whitehorse, Yukon Territory, under date of May 22, 1943. On that date, Lieutenant Colonel Dee Berry, Signal Officer of the Command, reported that the 1,580-mile telephone line paralleling the new Alaska Highway is probably the longest line stretched across uninhabited wilderness and reaches the farthest north. This line was pushed through in nine months by workmen operating in weather as low as 60 degrees below zero, working around mountains, through swamps, and across glacier-fed streams. Rural telephone lines pale into insignificance when compared with this remarkable new telephone service.

The American Telephone & Telegraph Co., which has been urging us through its advertising to refrain from long-distance calls so that lines may be free for war business, including calls from camp to home, has also called the attention of Mr. and Mrs. Public to the fact that this company alone has planned to spend a billion and a quarter dollars to take care of the telephone needs of this country after the war. Such needs will include an extension of the automatic dial telephone exchanges, the installation of which was stopped by the war, and undoubtedly the placing of a much greater mileage of cable underground as protection against storm and vandals. Many construction engineers have marveled at the heavy-duty tractor cavalcade which has slowly rumbled its way from coast to coast, plowing a trench, laying a cable, and carefully burying it in one continuous operation. We may see this repeated with smaller cables in many parts of the country.

Telephone companies have long had the highest reputation for the modernizing of their equipment and structures. In the post-war period, this will mean erection or rehabilitation of many of the thousands of telephone exchanges and service garages throughout the country, opening up the opportunity for the general contractor and building contractor to bid on work of this character in his own locality.

Telegraphy

Since the prospective merger of the two great telegraph companies of this country is at present in a state of flux, little is available as to prospective post-war construction by these agencies. Considerable publicity has, however, been given to the new equipment, still under cover, which will permit the sending of a telegram in much the same manner as we would mail a letter today, and which will deliver the message just as you send it, in your own handwriting.

Caterpillar Photo

Laying toll cable for the Illinois Bell Telephone Co.—a type of work of which considerably more will be done after the war, made possible by this effective cable-laying outfit.

David O. Woodbury, writing in *Collier's* magazine, discusses the "mail-box" telegraph offices, stating, "The system will be based on the present 'facsimile' method of transmitting pictures by wire and radio and will possibly do away with small telegraph offices altogether. Automatic telegraphing machines will stand ready to receive your messages in the foyers of office buildings, hotels, and stations, perhaps even in the corner drugstore. You will merely write out your telegram on a prepared blank, drop it in the slot, follow it with a coin and

(*Concluded on page 6*)

To Hold Our Place in the World of Tomorrow We Must Conserve Our War-Wasted Resources through Research

✦ THE post-war era must be one of the greatest economy and effectiveness in the use of our natural resources, our public tax money and private investment. The drainage of petroleum from our deep wells, the speeded mining of our metallic ores and the ruthless cutting of our forests for the wasteful crusade of war cannot be continued if this vast nation is to survive. We do not want political or industrial isolation, but war has so speeded the consumption of our national resources that only the most efficient use of materials, man-power and money can be tolerated in the decades following the war.

Such economy in the peaceful years ahead can come only through study, through research, seeking better practices in making materials available, finding less wasteful uses of these materials, and producing them so as to insure longer service from the ultimate products. We have prided ourselves on our efficiency in the past, but we have been wasteful even in the most effective use of our resources compared to the efficiency with which we must use our remaining resources to prevent becoming a decadent industrial nation dependent entirely on other countries for our raw materials. Every drop of water behind the great concrete dams we have built and are building must be used to produce more electricity than its pre-war ancestor, or must irrigate land more effectively, so that more power for industrial use, or more food for man and beast, may be available from this one of our greatest replenishing natural resources.

What Is Research?

The term "research" has fallen from its high estate, much like the word "propaganda". Originally propaganda referred solely to the effective missionary work and preaching which promoted the extension of the Christian faith. Today propaganda by common usage refers to any statement of enemy or friendly power aimed to influence the domestic or battle front to the advantage of the issuing power. Similarly research today means to the popular mind any compilation of facts gathered from library or current literature from which quick conclusions may be drawn to support a preconceived idea. Research in its proper conception is the application of trained open inquiring minds to problems of science in order to develop new more effective methods, processes or designs. It includes careful, considered studies of existing conflicting opinions and methods to clarify and promote efficient use of human thought and endeavor.

Applications and Opportunties

A field greatly in need of intensified research, and in which a large part of our readers is interested, is the wide essential field of highway design, construction and use. Among the specific problems greatly in need of future research in the highway field are: soil mechanics and subgrades; design of both concrete and bituminous pavements, including mixes and durability, expansion joints and joint fillers, to mention some outstanding needs; and construction operations, including management studies.

Subgrade studies have been advanced, but there is still an urgent need for further theoretical and practical information, properly correlated, on subgrade stabilization through soil mixtures and bituminous and cement mixes, as well as drainage. In soil mechanics, all important in the realm of subgrades and fills, practically all of the easy things have been done. The need now is to determine simpler relationships in the complex formulae of the science so as to hasten their application in the field of construction. In other words we want to take them from the blackboards and put them into the roads.

The design of highway and runway pavements, particularly of the flexible type, needs more study and research by men of open, inquiring minds. Much highway construction has been done during the war on an insufficient scientific basis. The work may be all right,—a few years will tell. There was need for speed in military construction which prevented essential studies of the many

(*Continued on page 14*)

Wartime Maintenance In Franklin County

Well-Conceived System of Peacetime Is a Great Aid in Restricted Work Today in Central Ohio County

(*Photo on page 68*)

✦ THE fact that the highway work of Franklin County, Ohio, has been well organized, with a thorough-going system of maintenance for many years, somewhat lightened the severity of the second asphalt-freeze order which affected the midwest states. The early start of intensive maintenance in May, 1942, made it possible to complete about 90 per cent of the annual bituminous maintenance program before July 22, when the freeze order was issued.

Work had been speeded because of the feeling that lack of shipping facilities might cause a delay or disruption of deliveries later in the season. In May the maintenance crews worked the usual 8 hours daily, but this was increased to 12 and then 14 hours early in June. Rather than following the usual schedule of completing one type of bituminous maintenance over the entire county before starting the next higher type, work was pushed on all types in a given section to minimize hauling and travel. This resulted in the completion very early in the season of some work for which material might not have been released after the freeze.

The County Roads

Franklin County contains 550 square miles, of which 40.5 square miles are within the city of Columbus, capital of the state. The population of the entire county is 388,712, of which 306,087 is accounted for by Columbus. The total mileage of highways and roads within the county is 1,241.97 miles. as follows:

County roads	741.98 miles
State highways	160.45 miles
Township roads	108.41 miles
Township streets	231.13 miles
Total	1,241.97 miles

The county rural road mileage of

(*Continued on page 22*)

Mixing and leveling a drag maintenance treatment in Franklin County, Ohio, using a power grader with a Gledhill attachment.

Your post-war road or street program

A series of advertisements pointing out how TEXACO Asphaltic products can fit into your program

#7

TEXACO
COLD-LAID ASPHALTIC CONCRETE

Constructing a TEXACO Cold-laid Asphaltic Concrete pavement over an Asphalt Penetration Macadam base on a New York State Highway. Small photo shows same type of TEXACO pavement laid on a worn brick street in Nanticoke, Pa.

The all-important feature of TEXACO Cold-laid Asphaltic Concrete is the length of time it remains workable. This plant-made mix of TEXACO Asphalt and aggregate need not be used at once. It may be stock-piled for future use, the length of time elapsing before use depending upon weather conditions. The prolonged workability of TEXACO Cold-laid Asphaltic Concrete makes possible long hauls by truck or rail from plant to distant jobs.

Aggregate used in this Cold-laid type of TEXACO construction is dried and primed with a petroleum distillate by plant-mixing. The primed aggregate is then plant-mixed with TEXACO Asphalt Cement. A small percentage of hydrated lime in the mix causes an increased thickness of TEXACO to coat the aggregate.

TEXACO Cold-laid Asphaltic Concrete paving is laid in two courses. The lower course, which represents three-quarters of the total thickness of the pavement, contains coarse aggregate. The thin top course contains small aggregate, which produces a dense, waterproof, non-skid surface.

While TEXACO Cold-laid Asphaltic Concrete may be laid on all types of foundation, it has been employed extensively and with excellent results in New York State, for example, to resurface worn cement concrete highways.

In addition to its wide use as a pavement, Cold-laid Asphaltic Concrete also makes a highly satisfactory mix for patching and other maintenance.

Here is an economical, durable pavement, offering practical advantages due to its delayed setting up, which should be considered in your plans for post-war street, highway or airport projects. To aid you with such plans, a TEXACO Engineer specializing in Asphalt construction is at your service.

THE TEXAS COMPANY, *Asphalt Sales Dept.*, 135 East 42nd St., New York City

Boston Philadelphia Richmond Chicago Houston Jacksonville

TEXACO REG. T. M.

TEXACO ASPHALT

Contractors and Engineers Monthly

THE NATIONAL BUSINESS PAPER FOR CIVIL ENGINEERING CONTRACTORS AND HIGHWAY ENGINEERS AND COMMISSIONERS

Member of Controlled Circulation Audit

Issued Monthly by Buttenheim-Dix Publishing Corp.
Editorial and Business Office: 470 Fourth Ave., New York City 16

Printed in Mount Morris, Ill., U. S. A.

THEODORE REED KENDALL.....Editor — O. E. POTTER.....Managing Editor
EDGAR J. BUTTENHEIM.....President — DONALD V. BUTTENHEIM.....General Manager
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BRANCH OFFICES
Chicago 6, Ill., Daily News Bldg., George S. Conover, Vice President; John T. Dix*
San Francisco 4, Calif., Mills Bldg., and Los Angeles 15, Calif., Western Pacific Bldg., Duncan A. Scott & Co.

* On leave of absence for military duty.

Do You Want the War to Continue?

Are you, as a contractor or engineer, are we as a nation, is the world prepared for a sudden outbreak of peace in Europe or the Orient next month or even early next year? This war, a mosaic of fighting fronts all over the world, involving many nations for many reasons, which together form the pattern of global war, will probably not end soon or all at once. But recent events, the fumbling and uncertain policies in North Africa, the present confusion in Italy, the lone wolf attitude of Josef Stalin, and the fact that the President of the United States considered it necessary to lash out publicly at a well-known columnist for speaking what seems to be the truth about the resignation of Sumner Welles, all point to the fact that this country is not ready for the specific problems of peace.

With politics apparently more important than preparations to win the peace, our present Administration has yet to give evidence of being ready for peace. Secretary Hull's recent speech on foreign relations was a fine outline of broad abstractions but offered no assurance that we know what we are going to do if any one of Hitler's satellite states should ask for peace tomorrow. But he controls the solid south needed to insure a fourth-term nomination and reelection of the President. Both the President and Prime Minister Churchill agreed on the selection of Quebec for their recent conference in order to bolster the political position of McKenzie King, the Canadian Prime Minister, whose popular support is rapidly waning in Canada.

The preparation for meeting the problems of the cessation of hostilities and the reestablishment of peace in the world should not be a political issue. It is a matter of the gravest national and international importance, and broad general outlines of international cooperation and good will are not enough; it's time to get down to brass tacks with a definite plan—in fact, several definite plans to meet any one of a number of situations which might occur.

In spite of rumors and reports of people and organizations in this country who are entirely willing to reap the benefits of war for years to come, it is inconceivable to us that any civilized person wants to prolong by one hour the devastation and destruction of this conflict. Unconditional surrender and complete victory we must have; the sooner the better. *But*, the sudden complete surrender of Germany or Japan could be even more of a catastrophe than a concerted bombing of our East coast, our Mid-West arsenals, and the West-coast airplane factories by all that is left of the Nazi and Nipponese forces, unless we are prepared for it.

We have thousands of industries, hundreds of cities, and states, which are, like the old negro, "getting ready to begin to think about doing something". There are plenty of thoughts about tomorrow but far too few plans for things which can be done and financed at home without dipping into the Federal treasury, which after all you and I have to replenish. Many of these individuals and groups, riding along on the wartime wave, are going to get a terrific jolt when cessation of hostilities suddenly changes the whole picture of things.

Get busy with your engineers, make definite complete plans *now*, ready for letting, or you may be the man who wished the war had kept on a little longer.

Share Your Car!

Car-sharing has declined at such a rate that the apparent slackening of effort "is a serious blow to the wartime conservation movement", according to the Highway Traffic Advisory Committee to the War Department.

Gasoline and oil, rubber and transportation will become increasingly critical, so share your car and conserve them.

Contractors' Booklet On Post-War Planning

A very interesting booklet which is an excellent public-relations job by contractors as well as a presentation of practical information on the place of construction by contract in the post-war period has just been issued by the Associated General Contractors of Minnesota. Prepared by that organization's Public Relations Committee, composed of C. T. Naugle, Naugle-Leck, Inc.; C. F. Sculley, C. F. Sculley Equipment Co.; and F. B. Winston, Winston Bros. Co., this booklet is entitled "Postwar Construction and the Taxpayer" and is meant for the average citizen who, as a taxpayer, has a vital stake in construction, both private and public.

Members of the Minnesota A.G.C. are anxious to share with fellow-contractors throughout the country the results of the research represented by this pamphlet and therefore have made available extra copies of the booklet to those interested in studying it. Other A. G. C. chapters and highway contractor groups should find in it the stimulus to prepare similar booklets, dealing specifically with the post-war planning and public-relations problems in their own localities.

The booklet is divided into three sections. The first deals with the vital place construction has had in the life and needs of every human being, showing by means of charts as well as text, the importance of this great industry in the national economy and the reasons for construction by contract. Part II, "Construction and the War", outlines the magnificent job done by the construction industry to meet the urgent needs of America's war program, while Part III deals with post-war planning and construction, pointing out the necessity of definite planning for construction *now* to make possible the immediate start of essential construction when the war is over and to avoid the disastrous errors of depression and unemployment of the '30's.

Copies of this booklet may be secured direct from the Associated General Contractors of Minnesota, Builders Exchange Bldg., Minneapolis, Minn.

Concrete Patching For Concrete Roads

No. 6 of the Highway Research Board bulletins on wartime road problems deals with the subject of patching concrete pavements with concrete. Under design, the bulletin discusses size and shape, thickness of patches, reinforcing and jointing. Under preparation of the area to be patched, suggestions are made for the improvement of the subgrade support adjacent to the patches, cutting old slab, trimming and cleaning edges, underpinning old slab, and subgrade preparation. The concrete mix, mixing and placing, finishing and curing, cleaning up the site after the patching is finished, and traffic control are also covered.

Because of the importance of keeping present highways in the best possible condition to carry wartime traffic, the Highway Research Board believes that it can be helpful in disseminating in usable form the best available information on various phases of highway technology in which common practice has not become established or in which practice must be modified during the war. The recommendations in this and others in the series on wartime road problems are based on wartime restrictions and needs and are intended as guides for use only during the period in which these conditions prevail.

Copies of this bulletin No. 6 on patching concrete pavements with concrete as well as the preceding five bulletins may be secured by interested highway engineers direct from the Highway Research Board, 2101 Constitution Ave., Washington, D. C.

"It's that new woman operator, baking a cake for her lunch!"

New Book on Trees In War and in Peace

The new book "Shelter Trees in War and Peace", by Ephraim Porter Felt, D.Sc., has a message for all roadside development engineers and landscape architects, as well as for those concerned with trees as camouflage and concealment. A complete discussion of the care of trees, the book has as one of its objectives the saving of more than a million trees injured and damaged as a result of hasty war construction, and points out the important role the engineer can play in preserving our trees by suggesting conservation means on every construction project. An interesting point made in this connection is that to leave the trees standing and unmarred is not enough; conserving them means seeing to it that the adjacent construction does not deprive them of the nourishment and water necessary to their continued life.

Chapters of special interest to highway engineers are entitled "Engineering and Trees" and "Construction Work and Its Effects on Trees", while roadside development engineers and landscape architects will find many other chapters on the selection of shelter trees, tree care and preservation also of interest and value.

Copies of "Shelter Trees in War and Peace" may be secured by those interested direct from the publisher, Orange Judd Publishing Co., 15 E. 26th St., New York City, or from this magazine. Price: $2.50.

Conservation Important

Every industrial and commercial firm in the nation, as well as all other organizations and all private citizens, have been asked by Donald M. Nelson, Chairman, War Production Board, to adopt at once a broad conservation program to save critical resources of manpower, fuels, materials, and equipment. These resources include coal and oil, gas, electricity, water, communications, and transportation, as well as rubber, metals, paper, and other materials.

Although the construction and highway industries are fully aware of the importance of conservation, this appeal for broadening the scope of conservation activities should have careful consideration and action. The savings in a single establishment in heat, water or electricity may not seem very much, but multiplied by thousands and millions of other similar establishments, it amounts to a staggering total. For example, it is estimated that a 10 per cent reduction in the domestic and commercial use of electricity would save 4,000,000 tons of coal or its equivalent and more than 75,000,000 lamp bulbs.

The rate at which we are using up our natural resources in the war effort is beginning to be a cause for considerable concern. Since we cannot cut down on the use of these resources in war production, it is up to the citizens of this country to conserve these resources in civilian life just as much as possible.

Mixing scarified material, new aggregate and cement with the SEAMAN MIXER

The water increment has been added. The SEAMAN facilitates control of the damp-mix operations

FLEXIBILITY UNLIMITED!

SEAMAN *Engineering Meets The Challenge of New Soil Stabilization Developments*

On a midwestern highway the old surface was scarified prior to re-mixing with cement. *Question:* could the SEAMAN MIXER pulverize the scarified material? — It could, — and did!

In the next step, — the SEAMAN doubled its value, for it mixed the pulverized material with cement in approximately one-tenth the time originally estimated for the work using farm tillage tools.

Again,— just recently on a military airport the SEAMAN was put to work dehydrating the base course. In *one pass* the SEAMAN reduced moisture from 4% to 2%, — the level required by the supervising Army Engineers. Those responsible for the job stated that thousands of dollars were saved in the dehydrating operation alone!

New methods, — new applications. The SEAMAN is engineered to take them in its stride.

"EVERY SOIL STABILIZATION JOB NEEDS A SEAMAN"

SEAMAN MOTORS
MILWAUKEE
WISCONSIN

New Communications Will Aid Construction

(*Continued from page 2*)

go away. Delivery at the other end will be by messenger.

"In China, where writing is in picture words, facsimile is likely to replace all conventional telegraphs as soon as machines are available, in order to eliminate the army of operators now required to translate each picture word into code and then back again."

Radio

David Sarnoff, President, Radio Corp. of America, reported to the stockholders of his company at its last annual meeting that the company's manufacturing plants had developed into "gigantic arsenals of radio", which were developing new instruments to give the American armed forces the most modern radio equipment in the world. Much of the outstanding work being done must remain a secret until after the war. But Mr. Sarnoff further said that radio instruments would emerge from the war "almost human in their capabilities", possessing not only a sense of direction but a sense of detection that will open new fields of service. The safety of aviation will be greatly enhanced, he said, for the aviator will be able to see the ground through clouds or darkness, collisions will be averted, and warnings given of mountains ahead and structures below.

One contribution which radio will make to the post-war construction job will be the great service of the walkie-talkie. We can see the construction superintendent out on the job, (he was a Captain in the Army Signal Corps), walking around with his batman or orderly with a walkie-talkie strapped to his back. An audible signal comes in, and the superintendent is in touch with his office, making an important decision on a shipment of materials. A few moments later he notes a piece of equipment which is broken down, so he calls the office immediately, telling them to have the shop send out the equipment-maintenance truck. Radio telephony was used on the Trans-Bay Bridge in San Francisco and in other places before the war, but the walkie-talkie will be the construction man's communication system in the future.

Television

We are going to have television after the war. That is the statement of men in the radio industry and others high in the technical field. Commander E. F. McDonald, Jr., President, Zenith Radio Corp., in October, 1938, said that "television was around the corner," and in 1943 he still feels the same way about it, but has a caution to add. He states, "Technically, television is all right, but economically it is just as unsound as it always was. It will be a great industry one day when a means is found of paying for the programs; in other words, a box office. There is nothing wrong with television that money will not cure, but that cure has not been found—yet.

"1938 advertising and publicity on television was premature and potentially harmful. . . . And now again, the impractical type of crystal-gazing publicity and advertising on television and most all post-war radio can be extremely detrimental to your (addressed to Zenith radio dealers) future business. Sensible, practical advertising, on the other hand, can be immensely helpful to you."

Television was only an infant before the war but has been pushed ahead by the war. This fact is most simply stated by Alexander de Seversky, the well-known airplane pilot and designer, who said, "Because the instinct of self-preservation is greater than the profit motive or any other human urge, science, generally speaking, makes more progress in a year of war than in a decade of peace."

Although once limited to a score of miles from the radio antenna, television has been received across the Atlantic. Technical improvements are bound to reduce the cost of the television scanning equipment and to increase the size of the moving image. We do not feel that it is beyond the realm of possibility that a scanning camera may be set up in an observation post on a large construction project, permitting a study of operations at the project manager's office or at the home office hundreds of miles distant. And both at the same time, so that on the conference telephone line the superintendent on the job, with his walkie-talkie, the project manager in his office at the site, and the Board of Directors can all discuss the job and see it at the same time.

Electronics

The new mystery term "electronics" refers merely to the application of variations of the radio vacuum tube to the control of electricity. It existed in 1929, before we laymen ever heard the term, when Dr. V. K. Zworykin of RCA Laboratories, through his research in electronics, gave radio the iconoscope to see with and the kinescope to reproduce what the iconoscope had seen. Today we have Radar, the miracle eye that sees invisible objects and points to them with an accuracy far beyond human ability.

One of the present peacetime uses of electronics in wartime is to control the speed of electric motors, maintaining any one of an infinite number of speeds far more accurately than the fastest human hand and brain. This is done by a device consisting of a team of electronic tubes, which control the power delivered to a direct-current motor requiring a uniform speed for machine tools and other equipment where breakage might occur if the rate of speed varies. Electronics will serve other controls and safety devices too numerous and too complicated to mention. However, we shall soon hear of devices and methods of applying electronics in construction to simplify and create greater accuracy. "When better methods are created, CONTRACTORS AND ENGINEERS MONTHLY will report them."

A word of caution should be expressed regarding the application of electronics research which has been so greatly stimulated by the war. Many of the military uses have no comparable civilian application, and at the end of the war probably many of the applications which have been developed for military purposes will not be released for civilian use. Therefore, we should not look forward to a complete revolution in the control of machines and equipment by electronics immediately because there will be delays due to conversion of plants manufacturing electronics devices, there will be certain restrictions on their use by the military, and then there will be others for which there is no comparable application in civilian life.

Save manpower for warpower. Accident prevention on the job is a contribution to Victory.

Protecting Concrete From Surface Scale

To eliminate the surface scale caused by freezing, thawing, and ice removal methods on concrete highways, chemists of the Hercules Powder Co. have worked for five years in cooperation with various state highway departments, Federal agencies, and the Portland Cement Association. Now concrete roads in at least fifteen states and concrete runways on airplane landing fields have been made resistant to severe winter conditions through the addition of about a tablespoon of Vinsol, a pine wood resin, to each sack of cement used in their construction. Fractional amounts, ranging from 2½ to 4½ parts in 10,000, (0.025 to 0.045 per cent), of the resin, extracted from southern pine wood by Hercules, are added by cement manufacturers to the clinker during grinding. Recently Hercules dedicated to public use all patents covering the use of Vinsol resin in cement, which made it possible to use this chemical in cement without payment of royalties.

Test roads, on which strips of resin-treated portland-cement concrete were laid side by side with untreated concrete, have been constructed in Delaware, Illinois, Indiana, Kentucky, Maine, Massachusetts, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, South Carolina, Utah, Wisconsin, and in Canada on sections of the Queen Elizabeth Way. These roads show that in states where the strip of untreated concrete has deteriorated due to winter conditions, the section of resin-treated-cement concrete alongside it remains unaffected, it is reported. Vinsol-treated cement has also been used extensively by the U. S. Corps of Engineers for numerous jobs, principally in the construction of military airports throughout New England, New York, Michigan, and Illinois.

Further information on Vinsol, which is recognized in the specifications of the American Society for Testing Materials and by the Federal Government, may be secured direct from the Hercules Powder Co., Wilmington, Dela., by referring to this item.

New LeTourneau Brochure

"What to Do When Your Men, Material and Machines Have Gone to War" is the title of a new 12-page illustrated folder containing suggestions for securing more production from your LeTourneau equipment and showing LeTourneau units at work on all types of military construction.

This brochure describes the best methods for pusher, straddle and downhill loading, side-by-side and "slot" 'dozing, V-ditch cutting, bank sloping, and loading of rooted material. Photos and charts present the detailed "how-to" of each operation. Emergency repairs for parts are also discussed and illustrated.

Copies of this interesting folder, Form No. A-37, may be secured by writing direct to R. G. LeTourneau, Inc., Peoria, Ill., or from any LeTourneau-Caterpillar dealer. Just mention this item.

Difficulties Encountered On New Ohio Underpass

(*Continued from page* 1)

of these "entries". Due, however, to the variable nature of the unstable soils encountered during the first stage of construction, the B & O Railroad requested that additional sheeting be used in the other stages to provide a steel sheet enclosure of the excavated areas. The quicksand layers particularly caused anxiety by running out from unforeseen sources and allowing settlement at unpredictable points. At one stage of construction when excavation had been completed for a wing footing, and sheeting and braces placed, a rain storm so completely changed stability that pads which had previously supported the bracing gave way and the excavated area had to be backfilled to prevent track damage, until additional extra steel sheet piles could be driven and thoroughly braced below to prevent any possibility of movement in sandy veins.

Construction

The north 24 feet of the underpass structure was built first, 13 I-beams installed and the deck poured to carry the track. Then the middle section of the structure, 14 feet wide with 8 I-beams, was completed, and finally the south side 24 feet wide with another 13 I-beams. The first operation after the tracks were moved south was to drive the sheet piling. A McKiernan-Terry No. 7 steam hammer handled by an Erie steam crane drove the piling, and a No. 400 Vulcan extractor was used for its removal.

When Stage 1 was completed, the railroad company moved one track onto the completed section, and the contractor started the middle section, or Stage 2. One-half of the piling for Stage 2 was driven before any of the sheet piling of Stage 1 was pulled. Then, because of trouble with quicksand, each area to be excavated for concreting was boxed with cross lines of sheet piling. The excavation was handled by a Northwest crane and clamshell bucket down to the final trimming which was done by hand after the material was loosened by a clay spade operated by a trailer-mounted Le-Roi compressor. A Scheu Products Co. salamander made these areas comfortable for the workmen while excavating during cold weather.

Stage 3 was a repetition of Stage 1 as far as the shape of the area was concerned, and in Stage 4, the ends of the wing walls, the placing of which had previously been prevented by temporary track location, were built. The roadway contractor used a Northwest ½-yard gas shovel for excavating the remaining earth from beneath the completed structure so that the final paving could be laid.

Form Work

The vertical forms of the abutment walls and pier were made of ¾-inch plywood backed by 2 x 6-inch vertical studs at intervals of 16 inches. These forms were made in panels 8 feet wide. The sections were set up and held together by double 2 x 6-inch horizontal wales, at 2-foot intervals, through which the Dayton Sure Grip & Shore Co. tie rods ran and were held by a fastener and wedge lock at each end outside the wale. A button on the tie rod served as a bearing for the wedge lock and at a predetermined distance within the concrete a weakened section made it possible to twist the rod off beneath the surface of the concrete after the forms had been stripped.

The deck was poured in six sections, two of which, end to end, formed Stage 1, 24 feet wide. Stage 2, 14 feet wide, was formed by two similar sections end to

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Official U. S. Army Photos

"U. S. 1" on a South Pacific island might well be the familiar U. S. 1 in Florida. At left, the route at one of its loveliest points; middle, familiar highway markers designate the way to key points on the island at an intersection of two coral-surfaced routes; at right, building a coral road. The large drainage ditch in the foreground extends back to a revetment of large pieces of coral. A few months previous, this route was almost impassable.

U. S. 1 on an Island In the South Pacific

At an advance fighter and bomber base on a lonely island in the South Pacific, one would hardly expect to drive over smoothly-surfaced highways with the familiar markers "U. S. 1" at intervals for guidance. Such is the case, however, on one island in this theater of operations, as shown by the accompanying photos, nor is travel limited to a single highway. U. S. 30 and U. S. 70 run east and west across the island, while U. S. 1 traverses it from north to south.

When U. S. Army Engineers first landed on this coral strip, there was nothing thereon which might be dignified by the name of "road". In order to transport supplies and equipment inland, it was necessary to lay down a network of truck routes, and construct bridges and storage buildings. In place of concrete or macadam for the roads, coral was used. Since the latter material forms the foundation structure of the island, there was no supply problem and it proved an excellent substitute for the more common materials used for road surfacing. After grading and some use, if drainage is adequate, coral roads become hard and shiny and possess good wearing qualities.

Before the new roads were constructed, trucks carrying gas, oil and ammunition to the airfield required 1½ to 2 hours for a round trip. Now, using "U. S. 1", the running time has been cut to 20 minutes, with a corresponding reduction in wear and tear on the trucks, and their drivers. The scenery is reminiscent of the south U. S. seacoast states, and that semblance is heightened by the U. S. highway markers, which bring a breath of home to the Army Engineers who, in a few short months, have transformed a lonely island into a modern, efficient air base.

Draftsmen for War Work Needed by Federal Govt.

Over a hundred draftsmen are being sought by the U. S. Civil Service Commission for work essential to the prosecution of the war. All types of draftsmen are needed, particularly ship, electrical and mechanical draftsmen, as well as topographic draftsmen, and entrance salaries range from $1,752 to $3,163 a year, including pay for the 8 hours of overtime incorporated in the 48-hour Federal work-week. The agencies needing these types of personnel in the greatest numbers are the several bureaus of the Navy Department, the Coast and Geodetic Survey of the Department of Commerce, and the Geological Survey of the Department of the Interior. The Treasury Department and the War Production Board use statistical draftsmen.

Qualified engineering draftsmen in any field are urged to apply, and persons without previous experience in the fields where needs exist may be appointed and trained in the subject. The greatest need for draftsmen is in Washington, but there are positions open in all parts of the United States as well as its territories and possessions. Federal appointments are made in accordance with War Manpower Commission policies and employment stabilization plans.

It is pointed out that persons now using their highest skills in war work should not apply; others, however, may secure Announcement 283 and application forms from any first or second-class post-office, from Civil Service regional offices in regional headquarters' cities, or from the U. S. Civil Service Commission. Applications, when properly filled out, should be mailed to the U. S. Civil Service Commission, Washington 25, D. C.

Large Hydraulic Fill For Post-War Airport

Dredge Nebraska Brought Overland from West; Pumps 1,800 Yards of Sand per Hour Through Mile of Pipe

(*Photos on page 68*)

TO furnish greater commercial airport service at the close of the war, New York City has begun the construction of a new airport on the eastern shore of Jamaica Bay, Long Island, by placing 26,000,000 cubic yards of sand fill on the 2,600-acre site of the new airfield. With an area about five times the size of LaGuardia Field, New York City's present municipal airport, the new Idlewild Airport will provide not only miles of runway for land planes but also three seaplane landing areas and a seaplane basin as well.

The pumping of the sand fill for the Idlewild Airport will be completed next month by Gahagan Construction Corp., of Brooklyn, N.Y. Four hydraulic dredges have been used on this job, three of which are owned by the contractor while the fourth was brought in under a subcontract. The largest of the contractor's dredges, the 30-inch Nebraska, has an interesting history and is the largest all-electric hydraulic dredge on the East Coast.

Work was started with Gahagan's No. 5 and No. 2 dredges, and the Hazel No. 2, working under the subcontract. These dredges are credited with the following production:

Dredge	Size	No. of Days Operated	Total Yards Pumped	Average Daily Yardage
No. 5	27-inch	450	12,000,000	22,340*
No. 2	20-inch	226	1,933,504	8,113
Hazel	18-inch	150	1,000,000	6,600

*To July 1, 1943

These three dredges started work between January 31, 1942, and May 15, 1942, but the two smaller outfits did not prove economical with the long discharge lines required so were discontinued, leaving No. 5 to work alone until the 30-inch Nebraska was brought east and started operation on January 4, 1943.

Nebraska's Cross-Country Trip

The Nebraska was built by the Bucyrus-Erie Co. for work on the embankments for Kingsley Dam in Nebraska, starting from scratch by digging her own pool, working as long as the water lasted in the pool and then shutting down until enough water seeped in to start again. As the size of the pool increased in area and consequently in volume, the working hours were increased. When sold to Gahagan, the Nebraska was knocked down and shipped on 56 freight cars from Ogallala, Nebr., to Albany, N.Y., where it was reassembled and towed down the Hudson River and to the site of her present work.

The hull of the Nebraska measures 125 x 40 feet and is built in nine sections. Some of these had to be cut for shipment east.

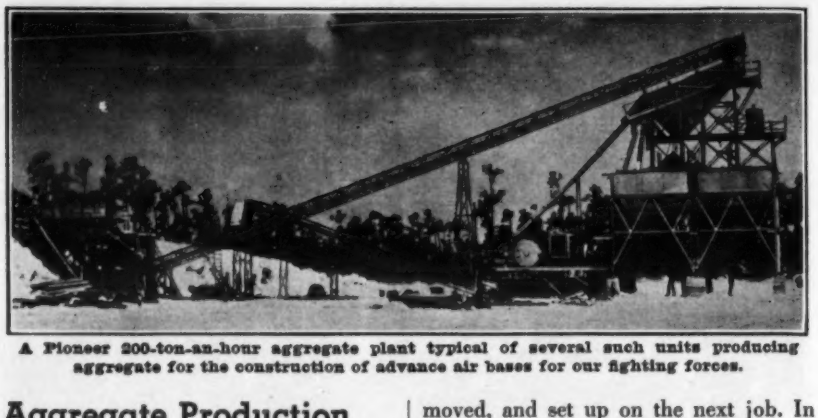
The Power Line

Current for the operation of the Nebraska is received at 27,000 volts at the shore transformers and reduced to 6,900 volts there.

The dredge operates with a submarine cable at present, but when first placed in commission at Idlewild, the cable was not available, due to priorities, so that it was necessary to rig three overhead cables on "trees" on the pontoon line to carry the 3-phase current from the shore to the dredge. This made it necessary to keep 2,800 feet of pontoon line working all the time, whether or not as much as that was needed to reach the borrow area. Each pontoon consists of four cylinders carrying two lengths of 40-foot flanged pipe and ball joints at one end to provide the necessary flexibility for the floating discharge line. To permit inspection and servicing of the

(*Continued on page 28*)

C. & E. M. Photo
The submarine electric cable for the dredge Nebraska coming up from the bottom onto the reel barge.



A Pioneer 200-ton-an-hour aggregate plant typical of several such units producing aggregate for the construction of advance air bases for our fighting forces.

Aggregate Production At Air-Base Projects

One of the main problems in the construction of advance air bases for our fighting forces is the production of suitable aggregate to be used for paving the runways and for concrete construction. Very seldom is there any commercial aggregate available, and the work usually calls for very fast aggregate production to meet construction schedules.

To help solve this problem, the Pioneer Engineering Works, 1515 Central Ave., Minneapolis, Minn., has designed several complete aggregate plants which are featured by their flexibility, as they will operate in gravel or quarry work, they can be used dry or for wet washing, and they will produce two, three, or four sizes, including sand. The No. 455 crushing and washing plant illustrated is typical of these plants. It is designed to be semi-portable; the main units are mounted on heavy skids so they can be easily moved into position on their foundations; the conveyors have all-steel frames made up of welded side frames and bolted knock-down construction; diesel power units provide ample economical power at any location; and steel bolted bins, which are easily set up, support the screening and washing equipment.

The plant shown has produced all the aggregate at two Atlantic air bases on widely separated islands. Because of the portable design and steel construction, it could be quickly knocked down, moved, and set up on the next job. In this plant a 40-inch x 10-foot traveling grizzly feeder by-passes the fines and controls the feed to a 30 x 42-inch primary jaw crusher. A 30-inch x 155-foot super-service belt conveyor conveys the aggregate to a 48-inch x 16-foot vibrating screen, the material is washed, and the sand and water pass into a paddle-type dehydrator. Four steel storage bins receive the finished aggregate, and oversize is discharged from the top deck of the screen to a Pioneer 54 x 24-inch roll crusher. Final crushing is performed in a 40 x 22-inch roll crusher. If no sand is available, "stone sand" can be produced in this final roll crusher. A return belt conveyor returns the crusher product from the rolls to the feeder conveyor and thus back to the screen.

Four Caterpillar diesel power units are used, one on the primary crusher, one on each of the roll crushers, and one for the screen, dehydrator, and conveyor. Multiple V-belts transmit the power to the crushers. The entire plant is anti-friction bearing equipped. SKF bearings are used on the jaw crusher and vibrating screen and Timken bearings on the roll crushers and conveyor idlers.

New Volume on Design Of Concrete Pavements

A new volume "The Structural Design of Concrete Pavements" has recently been published by the Public Roads Administration. This volume is a compilation of articles appearing originally in *Public Roads*, and is divided into five parts, as follows: Part I, a description of the investigation; Part II, observed effects of variations in temperature and moisture on the size, shape, and stress resistance of concrete pavement slabs; Part III, a study of concrete pavement cross sections; Part IV, a study of the structural action of several types of transverse and longitudinal joint designs; Part V, an experimental study of the Westergaard analysis of stress conditions in concrete pavement slabs of uniform thickness. At the end is a bibliography suggesting other material for reading and further study of the subject.

State and county highway engineers planning for post-war highway construction will find of interest and value the results of the studies and experimental work reported in this volume. Copies may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price: 40 cents.

Rework Old Oil Mat On Wyoming Project

Work on Strategic Network West of Cheyenne Divided, FAP New Operation and a State Widening-Remix Job

✦ A PAIR of paving operations on U.S. 30 west of Cheyenne, Wyoming, demonstrate effectively the salvage value of oil-mat construction. In improving this east-west link in the strategic network, 3.793 miles was merely a widening project to bring the highway up to the latest standards for width, while the 10.437 miles to the west was largely relocation, requiring completely new construction. The old mat on the shorter section, rebuilt as a state project, was a 2-inch road-mixed oil mat on which a 3-inch plant-mixed surface had been laid several years ago, plus a chip seal. This thick mat, reworked with a small addition of oil, provided sufficient material from the old 20-foot section for a mat 2 inches thick for the new 33-foot widened section. The 10-mile project FAP-SN-46(7)1941 involved completely new construction to the same new standard: a 44-foot gravel base 6 inches thick at the edges and 6 inches at the center line, a 33-foot oil mat 2 inches thick beveled 45 degrees at the edges, and a 24-foot chip seal, with the seal tack coat applied 41 feet wide. Both contracts were awarded to the Wyoming Construction Co. of Laramie, Wyo.

The Reprocessing Project

The top 2½ inches of the old oil mat was scarified by a patrol grader and in some sections was broken down by a sheepsfoot roller, disked to pulverize it, removed by LeTourneau scrapers, and stockpiled in a windrow along the edge of the road. Sufficient gravel was bladed from the shoulder to provide a windrow 8.4 square feet in cross section, or enough to form the new oil mat 2 inches thick and 33 feet 6 inches wide compacted in place. After the top course of the old oil mat had been removed, the balance of the old mat was scarified and the surface reshaped with the base for a depth of 4.4 inches with blading, watering and rolling and with the 5 feet on either side beyond the limits of the oil mat bladed to a slope of 10 to 1, feathered at the outer ends. The surface of the base has the same slope of ¼ inch per foot as the top of the oil mat and chip seal. The engineers' estimates called for the use of 70,000 gallons of water per mile during the rerolling of the base, and an average of 30 hours of roller operation per mile. The final base treatment was an application of MC-O at 0.4 gallon per square yard for a width of 41 feet, requiring 9,621 gallons per mile. This was applied by the contractor, using his own Littleford pressure distributor.

The asphalt specified for the reworking of the old oil-mat material, with such added gravel as was required to make up the needed volume of material for the new mat, was an SC-3 at about 1 per cent for the old mat, which had about 4 per cent asphalt in it from the original working, and about 5 per cent for the new gravel, or 10,000 gallons per mile for the 33-foot width of the new oil mat.

Wyoming is fortunate in having several oil refineries located at convenient points throughout the state, using crudes from groups of wells at those locations. However, the scarcity of tank cars for hauling under 200 miles required that all the asphaltic oil for this job be hauled in trailer tank trucks. The asphalt was hauled from Parco, a 300-mile round-trip haul, using two 4,000-

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C. & E. M. Photo

Transferring asphalt from a 4,000-gallon hauling truck by a pump mounted on the rear of the 2,300-gallon asphalt tank pulled by the Wood mixer on a Wyoming road-mix contract on U. S. 30.

A Rego Karweit Driller installed on a drill press in place of the conventional chuck, showing the small chips produced from drilling SAE 1020 steel.

New Device Speeds, Saves Shop Drills

A new device which is interchangeable with the conventional chuck on a standard shop drilling machine has been reported by The Bastian-Blessing Co., 4203 Peterson Ave., Chicago, Ill., as greatly increasing production. The announcement states that the device may be operated at handbook cutting speeds and feed rates with ordinary drills, and in drilling unusually deep holes in some materials, the time is reduced to about one half the time required in conventional practice. Under this new method, however, cutting speeds may be increased as much as 25 per cent above handbook ratings, if desired, thus effecting a large additional increase in production.

Contractors operating their own repair shops and state and county highway departments will be particularly interested in this device for post-war installation in their garages and service shops. This Rego Karweit Driller produces automatically at the cutting edges of the drill small uniform chips which clear the drill flutes easily, instead of long, whipping spirals which score the side walls of the holes and sometimes injure operators. Surplus coolant or lubricant washes the chips away, and the lubricant serves as a coolant to bathe both sides of the cutting edges of the drill at every revolution. This keeps the drill much cooler than is possible when conventional drilling equipment is used and greatly lengthens the life of the drill. It is reported that drills can be used two or three times as long without sharpening, and rejects in work are substantially reduced.

Complete information regarding the availability of the Rego Karweit Driller and its services may be secured direct from the manufacturer.

Line of Rock-Drill And Digging Tools

A complete line of rock-drilling, paving-breaker and digging tools for use on construction jobs and in quarry work is made by the Bicknell Mfg. Co., Rockland, Maine. These tools include digging chisels, moil points, chisel bits, asphalt cutters, frost wedges, solid drill steel, clay spades, round and square dirt tampers, tamper shanks, and sheeting drivers. All of these tools come in a variety of shank sizes, lengths and weights to meet the varying requirements of this type of work.

Another tool made by Bicknell is the Type 40 plug drill, which drills shallow holes from ½ to 1¼ inches in diameter in granite, concrete, brick, or stone, and is used principally for drilling wedge and shim holes for splitting stone, holes for anchor bolts, pipes, cable, and electric wires. Featured by simplicity of design and rugged construction, the Type 40 plug drill takes 11/16-inch round shanks 2⅝ inches long, and weighs 23 pounds.

Bulletin No. 52239 illustrates this line of Bicknell tools and contains further details on their sizes, weights, etc. Copies may be secured by interested contractors and state and county highway department engineers direct from the manufacturer by mentioning this magazine.

New Outdoor Welder

A new 500-ampere alternating-current outdoor welder has just been announced by the General Electric Co., Schenectady, N.Y. This new welder, which has a welding current range from 100 to 625 amp at 40 volts, is especially designed for outdoor work where exposure to weather is encountered. The welder is protected against the entrance of rain, snow and sleet by drip-proof construction of all openings in the top of the case and by a sealed window over the current indicator. Wide louvers serve not only to shed water but also to keep air velocity low. All internal parts have a special finish for protection against corrosion from moist air.

One of the features of this welder is the "idlematic" control which automatically reduces the output voltage to less than 35 volts when the arc is not in operation, but provides full power for welding the instant the arc is struck. This control also includes a switch operated by a handle extending through the top of the case for starting or stopping the welder manually.

In addition, this welder is provided with all the standard features incorporated in General Electric indoor welders of this type, including built-in power-factor improvement which provides low current input by maintaining the power factor at 95 per cent or better at all loads between 40 and 70 per cent of rating; finger-tip adjustment; stepless current control; fan-forced ventilation; and capacity for operation with long leads.

Reduced Maintenance, Ways and Means Used

Lessened Income from Gas Tax Offset by Less Miles Bladed; Equipment Leased To Army and Contractors

✦ IN making up the budget for state highway maintenance in New Mexico for the fiscal year starting July 1, 1942, it was considered advisable to predicate expected expenditures on a reduction of 30 per cent in gas-tax income. An analysis of the first six months' income for 1942 shows the tendency is downward, with a gross reduction of almost 16 per cent, while the reduction for the months February through June was 24.4 per cent. The difference between these two figures is due to an increased net of about $99,000 in January, 1942, caused by the highest total gas-tax income in three years for January, 1942, the lowest gas-tax refunds, and a debt service figure between the 1940 and 1941 figures.

New Mexico has about 8,000 miles of highway to be maintained throughout the year, including snow removal for a portion of the winter. By reducing the number of miles of highway to be bladed, the gravel-surfaced portion, a considerable reduction in the maintenance expenditures would naturally result. The total miles of highway to be kept under maintenance has been reduced to 5,400 miles. Many of the miles now dropped from the schedule for blading had a traffic of not more than 30 to 50 cars a day for the past three years, and this has now dropped to below 15.

In making the selection of highways to be dropped under the restricted program of maintenance, use was made of the Highway Planning Survey traffic studies of 1938-42. Where a community was served by two roads from the same direction paralleling each other, one was dropped from the blading schedule. In making the choices, care was taken to adjust traffic surveys that might have been altered by any new factors entering the picture. All farm-to-market roads have been retained for continued maintenance on the new schedule.

Equipment Rented

The State Highway Department has made other studies as to ways and means of insuring a reasonable income for the work of the Maintenance Division. The asphalt-freezing orders and the necessary reduction in construction by state forces, due to lack of materials as well as funds, left a pool of state-owned equipment for which there was no need by the state and which could be used in the war construction program elsewhere. The State Highway Department has leased over 140 pieces of such equipment to contractors and the Army for the war program. Most of it has gone to contractors who would otherwise have been unable to bid on various large grading and asphalt projects that were urgently needed. In several cases, the very contractors who wanted to bid on the few state highway projects that have been approved by the various Federal agencies for construction have rented state-owned equipment and thus the state helped in insuring the construction of its own needed roads.

The rental schedule used by the New Mexico State Highway Department is based primarily on the OPA schedule, but where that schedule does not include specific construction equipment the standard rental rates published in pamphlet form by the Associated General Contractors of America have been used. The Equipment Rental Agreement reads, in part, as follows:

"The State does hereby rent or lease to the Lessee the items of equipment herein above set forth on a (monthly, weekly or daily) basis at rental rates as provided in the table of rental rates issued by the Office of Price Administration of the United States issued under date of April 30, 1942, or any supplements or modifications thereof. Such rental shall be due and payable on or before the first day of each and every month hereafter and to be computed as follows:

"Par. 1399.2. Maximum rental prices.

"(a) *Daily Basis:* For any construction or road maintenance equipment leased by the day and

"(1) Which is not in actual use for more than 8 hours during one daily period, the maximum rental price shall be the rental price calculated upon the basis of the applicable rate 'per day' in the Table of Rates set forth in Appendix A, Table of Rates issued by the Office of Price Administration, dated Oct. 15, 1942;

"(2) Which is in actual use for more than 8 but not more than 16 hours during one daily period, the maximum additional rental price for such additional use shall be the rental price calculated upon the basis of 50 per cent of such applicable rate 'per day';

"(3) Which is in actual use for more than 16 hours during one daily period, the maximum additional rental price for the total additional use over 8 hours shall be the rental price calculated upon the basis of 100 per cent of such applicable rate 'per day'.

"(b) *Weekly Basis:* For any construction or road maintenance equipment leased by the week and

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Highway Field Calls For More Research

(*Continued from page 2*)

sites of construction, but today the bulk of military construction is over and we must study and correlate the information available to aid in the conservation of our resources in future construction, military or civil.

Both concrete and bituminous mixes need more study to speed the design of the mixes for the tremendous post-war program. There is the question of durability. What are the factors in the accelerated failures of some concrete and bituminous pavements? Why do some last for 10 years and then suddenly disintegrate? The Highway Research Board had started a program of fundamental scientific research before the war. This must go on for years, making a very comprehensive microscopic study of the hidden, obscure causes of success and failures. Most of the obvious things have been studied. Today we must delve deeper into the mysteries and use the trained minds of pure science for further research and then correlate their findings with practical field observations and results. Work of this type is going on in the field of concrete, but should be intensified. Research is less active in the bituminous field.

We have a tremendous volume of evidence on expansion joints, but we need to take time out to examine it in an unbiased, thoroughly scientific manner before we plunge ahead in the post-war highway program, repeating the blunders of the past. The best minds are far apart in this one small part of highway design, and the spacing of joints is still a major problem. Another is the proper reinforcing of the ends of the slabs to prevent corner breaks. Fillers for cracks and joints and for brick and block pavements provide another field of study which should be pushed *now* and not when the need for them expands geometrically and we are left with nothing but pre-war knowledge, even though considerable progress has been made on this subject by committees of the Highway Research Board and the National Paving Brick Association.

We can afford to study and improve our methods of construction in the field. We must have thinking men out in the field to observe and develop new methods. The time studies of the Division of Management of the Bureau of Public Roads were a practical form of research which had very beneficial results. This type of research cannot be carried on now but will be a fruitful post-war research project to effect still greater savings in the use of the more efficient equipment developed since the last studies were made. The use of 5 and 6-batch trucks to serve 27-E and 34-E pavers, to replace the traffic-congesting fleets of 1 and 2-batch trucks, should receive careful study and consideration. The relative efficiency of fleets of truck mixers delivering to spreaders, and of the multi-batch trucks of approximately equal weight delivering to the pavers will be another needed study during the post-war highway construction program. The manner of operating batching plants will vitally affect both methods of transportation and mixing and should be included in such studies.

The great economic and humanitarian field of safety in itself requires unlimited exploration to eliminate the hazards from the use of our highways at such post-war speeds as may seem then permissible. Safety in design varies with the geographical character of the terrain—the winding road of the mountains, the sweeping curves in rolling country and the long tangents on the plains. Safety is closely bound to economy and ruling grades and curves. Traction is a subject which every highway organization should study for itself so that the mass of evidence on the friction of tires on different types of pavement of varying surface texture with differing degrees of curvature at divers super-elevations may be studied, sifted and the best practices determined for economy in the operation of future vehicles and the safety of man.

Traffic paint needs to be applied frequently for the safe guidance of vehicles on straightaway and curves; it does not dry rapidly enough to prevent tracking by tires; it wears away too quickly. The use of reflecting beads has lengthened the life and increased the night visibility of traffic markings in many states. All this needs the attention of the research man far more than in the past.

What should be the criteria for the installation of highway lighting? Should it be confined to intersections, or include curves both vertical and horizontal, or will adequate use of reflecting center stripe prove as effective on curves in the

(*Concluded on next page*)

Post-War Planning Needs Research NOW

(*Continued from preceding page*)

reduction of accidents? A vast field of study and research for the engineer, lighting expert, paint chemist and psychologist is here opened for separate and joint endeavor.

Finally we must correlate the work of the research men with the needs of the design and construction engineers. A notable example of this is the exceedingly practical and helpful series of Wartime Road Problem pamphlets being currently issued by the Highway Research Board. These are prepared by construction and maintenance men of established reputation who make use of the latest and best work of committees of the Highway Research Board in the preparation of the pamphlets.

Research Must Be Promoted

In discussing needed wartime and post-war research with Roy W. Crum, Director, Highway Research Board, he made this statement: "At the moment I am most interested in the problem of stimulation of research and ways and means of getting it done. In the industrial field the value of research is well recognized, but in the civil-engineering field research work depends primarily on public support and with the changing personnel in public administration we have an ever present selling job."

How is this to be done to permit the training of minds for research? There must be greater support of research in our colleges and engineering schools through scholarships. Industry has done much in this monetary support in the past but must do far more in the future. There is no better way of distributing the accumulated fortunes of individuals or the profits of industry than the endowment of unrestricted research scholarships in the men's and women's colleges of this country. The war has proved, as no other testing ground, the great contribution of women in science, and their work in the laboratory can be as effective as man's in the field.

We need to train our future research men and women through graduate work. They must have the ability to carry on the study of scientific problems from the point where the ordinary engineering student leaves off.

In the field of highway research, our state highway departments have made great contributions in the past and will continue to do so, but they are primarily interested in the immediate problem. A need today is for more trained research men with a wide outlook who will tackle a big problem when the actual goal is not definite. Pure science? Yes! It was pure science to which Clifford M. Holland, America's greatest subaqueous tunnel engineer, gave credit for the studies which he used to create the practical, efficient ventilating system for the New York-New Jersey vehicular tunnel that now bears his name. That system has now become standard for all similar tunnel construction.

Research is necessary now, it will be an integral part of our post-war activities, and so we must have the trained minds ready for the attack, ready to carry through and win the accurate answers from their studies.

England Plans More Grade-Separation Units

A campaign to provide separation for vehicular traffic at important intersections in replanning and rebuilding the bombed areas in Great Britain has been launched by Rees Jeffreys, Chairman of the Roads Improvement Association, London, England, according to a recent issue of *Highway Highlights*. Writing in a recent issue of the English publication *Roads and Road Construction*, Mr. Jeffreys called for the use of fly-over junctions (grade separations to us) in future road construction.

The Editor of *Roads and Road Construction*, in commenting on the article, said: "Mr. Rees Jeffreys' references in our current issue to the extensive use of fly-over junctions in California will serve as a reminder that American practice is far ahead of our own in this aspect of road construction. This state of affairs is due not to any lack of realization of the advantages of fly-overs on the part of British engineers, but to the impression that they are too costly (in both land and money) to find extensive application in this country. We believe that future developments will prove this impression to be unfounded."

London pioneered in building the first important overpass bridge, the Holborn Viaduct, to carry east and west traffic in the center of London over the north and south traffic. The cost of this structure has been paid for many times by the saving in traffic time and the reduction of accidents with which it is credited. The viaduct was opened by Queen Victoria in 1869.

Cost of Alaska Highway Placed at $115,000,000

In the report of General George Marshall, Chief of Staff, to Secretary of War Stimson, the cost of the construction of the Alaska Highway is estimated at $115,000,000, including improvements to be completed by December 31, 1943, according to an Associated Press dispatch. The report states that the project got under way February 14, 1942, with orders to the Chief of Engineers to prepare plans, and actual construction began in March, 1942, with the arrival of Engineer and Quartermaster troops at Dawson Creek.

Training Specialists For Corps of Engineers

Skilled Construction Men Trained for Service with Engineers; Description Of Work at E.U.T.C.

(*Photos on pages* 34 *and* 35)

✦ SKILLED craftsmen, representing the cream of the nation's construction trades, have been arriving by the hundreds since last May at the Engineer Unit Training Center (E.U.T.C.) at Camp Claiborne, La. They were the vanguard of many more to come, the volunteer enlisted specialists who have entered the Army of their own free will, to make their skills available to the Corps of Engineers.

To cite just a few of the occupations listed in one day's increment of newcomers at the E.U.T.C., the crane operator is there, the construction foreman stands in the ranks beside the welder, the auto mechanic meets the bricklayer, perhaps from his home town or from half the continent away. These and a score of other trades and occupations are represented, as is every section of the nation.

Initial Training

The volunteer specialists receive the same training as is given to all Engineer troops. From the induction station, a specialist goes to a general reception center in the vicinity of his induction where he receives the first of his series of inoculations against diseases, is signed up for allotments, insurance and bonds, is issued Army clothing, and earmarked for shipment to some Engineer organization. This may be the Engineer Unit Training Center at Camp Claiborne, in which case he enters the 361st Engineer Regiment, which carries on the function of receiving the specialists along with its regular duties of an Engineer construction regiment in training. With this regiment, which acts as a "pool", holding the specialist until a call comes for a man of his classification, the volunteer starts his Engineer training.

The E.U.T.C. follows up what the reception center began. Inoculations are continued; officers interview the recruits, to make certain that each is properly classified; dental officers examine the newcomers' teeth, and necessary dental work is done as soon as time permits; eye examinations determine the need for glasses; and a check on clothing assures each man his proper supply.

Meantime, as this processing continues, the specialist is launched into his basic training. He may be transferred to his permanent unit before his basic training is completed at the 361st Engineer Regiment, or not until after it is over and he is at work in advanced training.

The basic training he receives, which is the same as given to all Engineer troops, provides him with the necessary background for the protection of himself and his unit and for working in harmony with his fellow Engineer soldiers. He learns military discipline, customs, and courtesy; he practices with the .30 calibre rifle, firing for record on the range at the culmination of this practice; he takes part in close order drill, formal marching, as well as learning something of informal bivouacs; he studies military sanitation and hygiene; guard duty; and defense against attack by mechanized forces, planes, or chemicals. Scouting and patrolling, field fortifications, camouflage, rigging, demolition, Engineer reconnaissance, map reading, night operations, and the care and use of tools and equipment are also on the curriculum of basic training, which lasts for a period of five weeks.

Advanced Training

At the E.U.T.C., after the basic period is over, the specialist begins eight more weeks of tactical and technical training. If he is by that time in his permanent organization, he may start advancement toward the ratings that he discussed when he volunteered for enlistment or induction in the Engineers. If he is still in the 361st Engineer Regiment, he may have been raised to one of the lower non-commissioned ratings, if his work in basic training warranted it.

During the tactical-technical period, the specialist or skilled draftee comes into his own element, provided there are vacancies in his line, by taking up in earnest the task he volunteered to perform. He may enter specialist classes at at Camp Claiborne or elsewhere, to adapt his skill to the needs of the Engineers. If he proves fully skilled, he may act as instructor for others not as far advanced as he. As his proficiency approaches the standards set by the Engineers, the specialist becomes eligible for the ratings available for craftsmen of his type.

Meanwhile as the tactical and technical training period is conducted among the units at the E.U.T.C., non-specialists are continuing the study of the general engineering skills begun in basic training. After an organization is thirteen weeks along in the training schedule, the specialists have generally all returned from their classes to join the non-specialists. The regiment, or whatever the Engineer organization may be, is then ready to act as a unit.

Organizational Training

In the organizational training period, lasting for an additional thirteen weeks, the unit begins to function as a whole. Training tasks and tactical exercises give each man, both specialist and non-specialist, a chance to perfect himself for the duties of military engineering and

(*Concluded on page* 30)

Duffy Appointed Director Of A.R.B.A. Public Relations

E. E. Duffy, formerly with the Wayne County Road Commission, Detroit, and the Portland Cement Association, has been appointed Director of Public Relations of the American Road Builders' Association, according to an announcement by Charles M. Upham, Engineer-Director. For the past 2½ years, Mr. Duffy has been Planning Secretary of the Wayne County Road Commission, and prior to that he handled general publicity and later highway promotion for the Portland Cement Association.

Mr. Duffy has for many years taken part in A.R.B.A. activities, having served as Chairman of the Anti-Diversion Committee and lending frequent assistance to various other committees. He is now preparing a series of publications, based on the A.R.B.A.'s Post-War Highway Construction Program, for distribution to the industry, to public officials, and to the public.

New Concreting Counsellor For Calcium Chloride Assn.

Announcement has been made by the Calcium Chloride Association of the appointment of H. Hershey Miller as an engineer representative, with the special assignment of counsellor on concreting. Mr. Miller was for many years Chief Materials Engineer for the Pennsylvania Department of Highways and later Testing Engineer for the Pennsylvania Turnpike Commission. For the past three years he has been Resident Engineer of the Pennsylvania Sand and Gravel Producers' Association.

Mr. Miller is the author of a number of articles on concrete problems and has served on committees of the Highway Research Board, American Society for Testing Materials, and the Pennsylvania Society of Professional Engineers. At present he is the President of the Engineers Society of Pennsylvania.

Collins Rejoins Cummins

Tom Collins, on leave of absence for the past year, has rejoined Cummins Engine Co., Columbus, Ind., in his former capacity of Manager of the Pacific Southern Region. Mr. Collins is a veteran member of the Cummins sales organization, having started several years ago as a sales representative of the Cummins dealer in Seattle. He later became Manager of the Central Region, with offices in Cleveland, and then was transferred to the West Coast, with headquarters then located in Phoenix. His new headquarters have been established at 411 West Fifth Street, Los Angeles.

Well-Equipped Shops For Wyo. Equipment

(*Continued from page* 1)

into halves longitudinally from east to west by walls and two steel roller doors, the outer section being used mainly for storage and the inner section for overhaul of equipment. At the center of the north side and in the west end are overhead doors, 20 feet wide and with a clearance of 10 feet 6 inches, giving access to the storage section, and through that to the repair garage.

The Outer Garage

The outer section of the building contains wash and grease racks and the radio repair department in the corner next the drafting room. The overhead doors at the outside are motor-operated while the inner steel doors are hand-operated. By having two sets of doors, the operations which do not require such warmth or comfort are carried on in the section that is more likely to be chilled by frequent opening of the doors in winter in spite of the use of unit heaters throughout the entire garage to maintain a uniform reasonable working temperature. In the northeast corner of the garage is a hot vat where gears and other parts are dipped in a hot cleaning solution to remove grease and dirt quickly before working on them in the shop.

Office Facilities and Storage

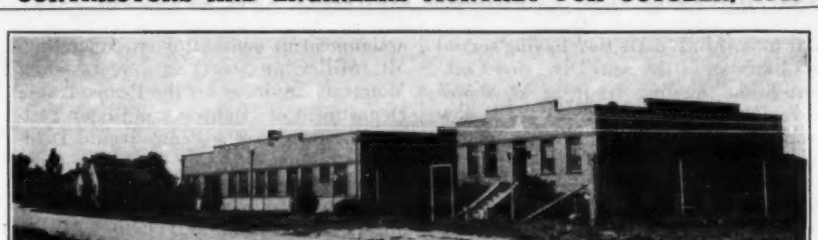
The entire east end of the garage is given over to storage and office facilities. At the front corner is a storeroom for small tools and maintenance equipment, such as shovels, chains, etc., and from this location all lubricants are dispensed from the original containers. Overhead, and continuing to the back of the building, is a mezzanine storage platform for heavier equipment and obsolete storage for machine screws, cap screws and the like that were used in the older equipment but have been superseded by heavier stock. In this upper storage deck are also the full stock of metal and wood highway signs, both standard and reflecting.

In the southeast corner is an office for the field engineers and immediately in front of it a drafting room for their use. At present, with the dearth of draftsmen, it is used primarily for storage.

The southwest corner of the garage is devoted to active parts storage, with metal bins for the parts and materials most needed for repairs. Here also is a brake riveter and a Sunnen hole hone for piston pins and a Raybestos brake-lining countersink drill for which there was no room in the repair garage.

The Repair Shop

Except for the space taken by the field office and the repair-parts storage at the other end, the entire length of the garage behind the protecting roller doors is given over to the repair shop and machine shop. Running the full length of the south wall is a heavy bench for the repair men, with windows over it and a profusion of overhead lights for dark days and night work. Back of it over the floor area where the overhaul of trucks



C. & E. M. Photo
The Wyoming State Highway Department equipment repair garage in Cheyenne, at left, and the Testing Laboratory at the right.

is carried on is a battery of reel lights which may be pulled down to light up any section of a machine.

On the bench, in addition to the regular mechanics' tools that are in constant use, are a Weidenhoff armature growler, an Electro Products Co. troubleshooter, a Weidenhoff electric generator tester, a Black & Decker valve facer, a small arbor press, and cupboards both above and beneath the bench for the storage of parts that are being held for work to be done and which will go into machines when the other repairs are complete. On the bench are two heavy-duty bench vises. Beneath one section of the bench, near the floor pit, is an exhaust fan to remove fuel fumes when testing engines.

The machine shop at the west end of the repair garage contains the needed equipment for most overhaul jobs on engines and highway equipment. There are several power grinders and buffers, a LeBlond 21-inch heavy-duty lathe, a South Bend 16-inch x 10-foot lathe, a Manley 60-ton hydraulic press, a Henry Prentiss & Co. milling machine, a portable electric grinder and shaper, a General Electric Tungar battery charger, a special sickle grinder, and small tools.

The blacksmith shop, set off from the machine shop by brick curtain walls, carries a fair stock of mild steel, a power hack saw, anvil and forge, and a heavy vise set on a steel rail concreted into the floor. A Lincoln electric welder is included in the equipment of the shop, as well as a portable Oxweld welding outfit and a welding table.

Running for 60 feet across the machine shop is a 2-ton Chisholm-Moore overhead traveling crane with a span of 20 feet, carrying a Hercules hand chain hoist. At the west end is the storeroom for "black gold", the Department's stock of new and recapped tires that is dwindling all too rapidly.

Highway Equipment

Included in the storage yard outside the garage, ready for overhaul or ready to go back into service, were some of the twelve 2,500-gallon asphalt transport

(*Concluded on next page*)

Wyoming Repair Shop And Storage Garage

(*Continued from preceding page*)

trucks used by the Department for hauling all its own asphalt to release tank cars for more important services at the present time. The big 3-auger Snogo was in the yard at the time of our visit, ready to go out on winter service. The Wyoming Department also has four Bros rotary plows mounted on Coleman-International four-wheel-drive trucks and FWD's.

While an inventory of the yard would be impossible, there were Buckeye spreaders ready to go out on chip-seal work and a large Coleman four-wheel drive truck with a drilling rig on it that has been used most effectively by the soil testing engineers for getting both deep and undisturbed samples of soil rapidly over a large area of the state when the location of new gravel pits was a necessity.

Personnel

The highway repair shops of the Wyoming State Highway Department are operated under the direction of the Maintenance Department. The garage at Cheyenne is in charge of F. B. Cordiner, Shop Foreman. J. G. Smith is the present Superintendent, Wyoming State Highway Department.

Hydraulic Control Has New Applications

The Sperry Exactor hydraulic control for the operation of industrial, marine and aircraft equipment is a single-tube remote-control system, with a capacity up to 400 inch-pounds, to provide easy and accurate control of a machine or piece of equipment from a distant point. At the present time, Sperry Exactors are doing a wide variety of jobs in airplanes and Naval craft and in war industries, but in the peaceful days to come, there will be many services it can render in the construction field as well.

The Exactor consists of a transmitter and a receiver, connected by a single tube. The cylinder, piston assembly, and spring assembly of the receiver are identical with those of the transmitter. In the standard arrangement, using one transmitter and one receiver, accurate control of one machine is provided from one remote point. Where it is necessary to control a machine from two or more remote stations, standard transmitters are located at the desired stations, and the tubes connected with each other at any point. The distance between transmitter and receiver depends upon required output and operating conditions, but under favorable conditions distances up to 80 feet will not affect operation. The receiver should not be located more than 25 feet higher than the transmitter but may be any distance below it.

The various set-ups and applications of Sperry Exactors to provide accurate, positive economical control of machines and equipment are discussed and illustrated in an 8-page booklet, copies of which may be secured direct from Sperry Products, Inc., 1505 Willow Ave., Hoboken, N. J., by mentioning this magazine.

New Pump Catalog

The latest Westco industrial-pump catalog is a 60-page volume describing and illustrating by means of photographs, cross sections and charts, the complete line of Westco pumps for a wide variety of services. Included are several pages on Pomona deep-well turbine and sump pumps, as well as considerable engineering data on units of measurement, head and pressure equivalents, and friction losses of water, to aid in the selection and use of various types of pumps.

Copies of this new Westco pump catalog No. 43 may be secured by interested contractors and engineers direct from the Pomona Pump Co. Division, Joshua Hendy Iron Works, 206 E. Commercial St., Pomona, Calif., by mentioning this item.

New Wire Rope Sales Mgr.

Appointment of T. H. McSheehy as Sales Manager of the Wire Rope Division has been announced by the Wickwire Spencer Steel Co. Mr. McSheehy, who has been associated with Wickwire Spencer since 1923, has served in a variety of capacities, the most recent being that of Pacific Coast Manager. In charge of wire rope sales throughout the country, he will make his headquarters at the company's general offices, 500 Fifth Ave., New York City.

J. A. Old succeeds Mr. McSheehy as Pacific Coast Sales Manager.

Tennessee Engineer Dies

Announcement has been made by the Tennessee Department of Highways and Public Works of the death of Briggs Smith, State Maintenance Engineer. Mr. Smith, who had been associated with the Department for 25 years, had held practically all engineering positions possible in the Department, including resident engineer, division maintenance engineer, division engineer, commissioner, state construction engineer, and state maintenance engineer.

H. T. Ammerman, formerly Division Engineer, who has been with the Department for 16 years, has succeeded Mr. Smith as State Maintenance Engineer. A native of Tennessee, Mr. Ammerman was associated with the Virginia Department of Highways before joining the Tennessee Department.

Handy Welders' Guide

A handy and helpful vest-pocket guide for welders has recently been prepared by Hobart Bros. Co., manufacturer of arc welders and welding equipment. This Guide pictures and explains in text what is wrong with different types of faulty welds and how to correct these faults; it suggests and illustrates all kinds of joints, fillet welds, and how to cut electrode waste; the three essentials of proper welding procedure and welding symbols are completely explained and illustrated; and a trouble check chart on welding machines and a reference table on decimal equivalents are included.

Copies of this helpful Guide may be secured free by writing direct to Hobart Bros. Co., Troy, Ohio, and requesting Vest Pocket Guide for Welders EW-95.

Minnesota Rebuilds Obsolete State Route

Improved Alignment and Grade Recently Completed On Highway 44 Presages Type of Post-War Work

(*Photo on page* 1)

✦ TYPICAL of the post-war work which the Minnesota State Highway Department is scheduling to bring obsolete highways up to standards more adequately meeting the demands of tomorrow's motor traffic is a 4-mile reconstruction project on State Highway 44 in southern Minnesota, completed last construction season by Morse Brothers of Rochester.

The heavily traveled road through rich agricultural country near Mabel, almost on the Minnesota-Iowa line, has been widened and re-graded over a 4-mile stretch, with the new highway by-passing the town. The old road was a narrow winding route with deep ditches and steep backslopes, giving scant clearance to cars in opposing lanes of traffic. The new highway, the contract for which was awarded to Morse Brothers on a bid of $74,219, has a 40-foot shoulder-to-shoulder width with wide shallow ditches and flattened backslopes. The sharp curves that carried the old road through a main city street have been eliminated, with the new grade extending with slight curvature along the edge of Mabel.

Work on the project was started early in the spring, with the contractor moving 33 heavy units of road-building machinery from a grading job some 40 miles to the east to start stripping for the new grade. Key units in the mechanical set-up on this grading project were three 8-yard Tournapulls and four 12-yard LaPlant-Choate scrapers with Caterpillar D8 tractors.

At the western end of the project, over a cut-and-fill section about 2 miles long, the Tournapulls provided the fill for the grade from a small cut and from side borrow. The haul was rather long and the 8-yard Tournapulls were well suited to the work.

The eastern half of the job is comprised of new grade built up from side borrow. On this section, four LaPlant-Choate 12-yard scrapers with Caterpillar D8 tractors and D7 pushers handled the dirt for the subgrade. Excavation over the entire 4-mile stretch totaled 265,172 cubic yards, with 1,325 cubic yards of binder soil and 55,000 cubic yards of fine sand for grade stabilization. The subgrade is clay from the cuts and side borrow, topped with a 1-foot stabilized lift of sand and binder soil, bladed and then compacted by sheepsfoot rollers pulled by two Farmall tractors. The completed grade was surfaced with 4,240 tons of crushed rock.

Morse Brothers worked the project day and night with three 7-hour shifts every 24 hours. The average payroll was about forty men weekly and a typical shift was comprised of four tractor-scraper operators, two pusher-tractor operators, three Tournapull operators, an operator for the Adams motor patrol, two operators on tractors with sheepsfoot rollers, and one on the D7 with bulldozer. No construction camp was maintained on the job, the men either living in trailers or boarding and rooming at the town.

Equipment Care

In charge of construction operations for Morse Brothers was Bill Mackey, an old hand at dirt moving and especially at tractor-scraper operations. His forte is keeping the equipment in productive operation, and this he does through a well-developed program of preventive

(*Concluded on page* 41)

Side borrow with a 12-yard LaPlant-Choate scraper pulled by a D8 and pushed by a D7 tractor. Inset, Sam Nelson, Dirt Foreman for Morse Brothers on the reconstruction of Minnesota Route 44, near Mabel.

Wartime Road Care In Franklin County

(*Continued from page 2*)

741.98 miles comprises the following types of surfaces:

Gravel and crushed stone	74.39 miles
Low-type bituminous paving	46.86 miles
High-type bituminous paving	610.52 miles
Portland-cement concrete	6.50 miles
Brick	3.71 miles
Total	741.98 miles

Planned Maintenance

The bituminous highways of Franklin County are normally surfaced-treated every 4 to 6 years, averaging between 90 and 100 miles of this type of work each year. Before work is started in the late spring, every mile of every county road is checked by one of the assistant county engineers and graded as follows: E, excellent; G+, very good; G, good; G—, below par; F+, better than average; F, fair; F—, below passing condition; P, poor.

As each mile of road is inspected and rated, notes are made as to the type of treatment which should be given to each section rated F— or P, so that all sections with these ratings are placed on the program for immediate maintenance operations. Following this, an estimate of the cost of the work required on the sections of highway needing maintenance that year is made in the form of a report to the Board of County Commissioners. The Commissioners then pass a resolution directing the County Engineer to proceed with the work after proper publication, the materials are purchased, and the work done under force account. This system has worked admirably since it places a section of highway under the degree of maintenance necessary to preserve the investment in the road. A mere skin treatment may be enough to heal fine cracks and enable the surface to carry on for several years. On the other hand, a surface in very good condition one year may have suffered from unusually heavy trucking during the autumn and winter and need a drag, or road-mix, treatment for strengthening the pavement. This system has resulted in great economies in the maintenance program in Franklin County.

Skin Treatment

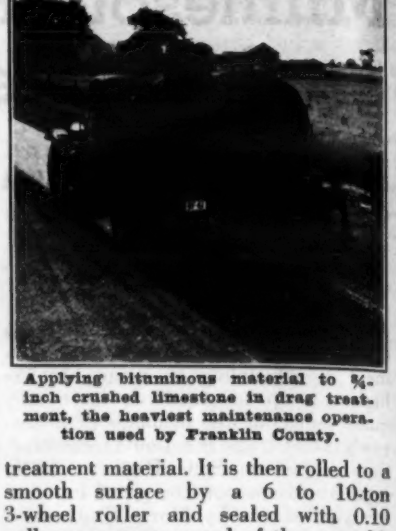
The minimum surface treatment for county highways, used where small cracks are showing up in the surface, or merely to skid-proof the surface, is skin treatment. RC-3 was used for the bituminous material in 1941, while an inverted cut-back emulsion has been used extensively since then. The bituminous material is applied at a rate of 0.33 gallon per square yard and is covered immediately with about 25 pounds of ½ or ¾-inch crushed local sandstone or gravel and then rolled by 6 to 10-ton 3-wheel rollers.

Skin treatment is used as a preservative or non-skid treatment only, as it does not improve the riding quality of the road surface. In thickly populated districts where the pavement is used to a large degree by pedestrians, the smaller screen-size stone is used as there have been many complaints that the ¾-inch stone is hard on women's shoes.

Seal Treatment

The seal treatment, as applied in Franklin County, is really a light drag treatment intermediate between the skin treatment for healing small cracks and the regular drag or road-mix treatment which is used for pavement strengthening. A considerable volume of inverted cut-back emulsion has been used, because this material is effective even when the road aggregate is damp. Under dry conditions MC-5 was used and, where gravel roads were being treated, they were primed with MC-1. All roads are given a thorough cleaning with a rotary broom when there is any dirt or loose material on them prior to any surface treatment.

The bituminous material for the seal treatment is applied at a rate of 0.15 gallon per square yard followed by spreading approximately 30 pounds of ½-inch crushed sandstone or gravel, immediately followed by an additional 0.2 gallon of the bituminous material. This asphalt and stone sandwich is then bladed into a windrow by a small Gledhill grader, which gives a partial mixing. Next, a power grader, with a Gledhill attachment to insure the elimination of low spots in the surface, is used to complete the mixing and laying of the seal-



Applying bituminous material to ¾-inch crushed limestone in drag treatment, the heaviest maintenance operation used by Franklin County.

treatment material. It is then rolled to a smooth surface by a 6 to 10-ton 3-wheel roller and sealed with 0.10 gallon per square yard of the same bituminous material, followed by a second

(*Concluded on next page*)

Organization, Costs For County Road Work

(*Continued from preceding page*)

application of about 10 pounds of the crushed stone or gravel which is again rolled. This type of treatment is used on penetration-macadam pavements which do not have a high crown.

Drag Treatment

The drag or road-mix treatment is the heaviest maintenance operation on Franklin County roads. It is used for pavement strengthening, on macadam roads it is used instead of a more expensive hot-mix material, and also to correct high crowns. The bituminous material for the drag treatment is applied to the pavement at 0.20 gallon per square yard followed by the spreading of about 50 pounds of ¾-inch crushed sandstone or gravel and then an additional 0.45 gallon of the bituminous material. This is immediately mixed and laid by a power grader with a Gledhill attachment. After the mixing and laying is completed, it is rolled to a smooth surface by the 6 to 10-ton 3-wheel roller and then sealed with 0.10 gallon per square yard of the bituminous material covered with 10 pounds of ½-inch crushed stone or gravel and given a final rolling. This gives a surface treatment about ¾-inch thick with distinct nonskid properties.

Maintenance Organization

Throughout the maintenance operations in Franklin County, every effort is made to keep one-half of the road being resurfaced open to traffic, and at the end of each day's work, the section on which work has been done is left so that motorists can use it without picking up the bituminous material.

The traveling maintenance crew which does the three types of surface treatment consists of 17 men as follows:

1 engineer
1 foreman
1 weigh master
2 equipment operators
4 distributor operators
1 heater operator
1 truck driver
4 laborers
2 flag men

The equipment used for surface-treatment operations consists of:

6 to 8 dump trucks which haul from local quarries on a ton-mile basis. This is the only equipment used that is not owned by the county.

1 ¾-ton canopy truck used to haul workmen to and from the job.
1 2½-ton dump truck with a 500-gallon water tank, a small gas-engine-driven centrifugal pump, a 55-gallon drum of gasoline, a 55-gallon drum of fuel oil, a spare tire for the spreader box, small repair parts, and tools for emergency repairs. Both the canopy and the 2½-ton service dump truck are equipped with complete emergency first-aid equipment.
1 Galion or Buckeye spreader box.
2 1,000-gallon Austin bituminous distributors.
1 Hough Tu-Way traction-driven pull-type rotary broom.
1 2-car-capacity Cleaver tank-car heater.
1 Gledhill pull grader.
1 Galion tandem-drive power grader with Gledhill mixing and leveling attachment.
1 Huber 6-ton 3-wheel roller with trailer for moving the roller.

The total original purchase price for this group of equipment used by the maintenance crew was about $30,000. All of the equipment is used on all three types of surface treatment, except that the Gledhill equipment is not used in skin treatment.

Maintenance Costs

County equipment is operated on an hourly rental basis which does not include any labor cost. Distributors are charged at $3.50 per hour, rollers at $1.25 an hour, heater at $0.80, spreader box $0.30, power grader $1.25, Gledhill pull grader $0.25, service truck $1.25, ¾-ton truck $0.40, and rotary broom $0.35.

The 1942 costs for the surface-treatment programs, the last full year for which information is available, are given in the accompanying table.

1942 Maintenance Costs in Franklin County, Ohio

Type of Treatment	Miles	Sq. Yards	Total Average Cost Per Sq. Yd.	Total Average Cost Per Mile
Skin	48.54	459,250	$ 0.0509	$ 537.00
Seal	12.67	135,063	0.0955	1,008.00
Drag	33.51	346,027	0.1237	1,305.00
WPA Drag	4.90	53,240	0.1711	1,807.00
Total	99.62	993,580		

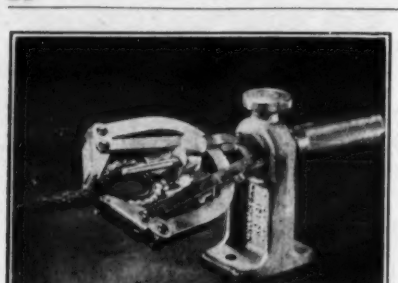
Personnel

Allan Slade is County Engineer of Franklin County, Columbus, Ohio, with Robert F. Koerner, Chief Deputy in charge of maintenance operations. George D. Bayne, Assistant Engineer, is in charge of surface treatment.

New Consultant at Lincoln

Announcement has been made by the Lincoln Electric Co., Cleveland, Ohio, manufacturer of arc welding equipment, of the appointment of William J. Conley, former Chairman of the Engineering Department of the University of Rochester, as Consulting Engineer. Mr. Conley will serve as welding consultant for various industries, handling problems on mechanical and structural design utilizing welding, as well as metallurgical problems involving welding processes.

In connection with his work at Lincoln, Mr. Conley will also have charge of the company's welding educational activities, consisting of courses in welding engineering and design as well as lectures and talks on welding in the plant and in the field before technical societies and industrial groups.



The new Universal cable splicer.

New Cable Splicer Sturdy and Speedy

An improved design of cable splicer to meet the demands of wartime service has been announced by the Mechanics Engineering Co., Jackson, Mich. Known as the Universal No. 101, it is sturdily built of wrought iron, with fittings of manganese bronze.

This splicer, for which patents are pending, requires no adapters to handle the various sizes and types of thimbles and bushings most widely used, as they are firmly held by means of a sprocket chain and powerful jaws. Adjustment of the chain hold to various sizes of bushings and thimbles is made by setting and locking a single button. Any tendency of the cable to bulge is controlled by the chain as the splicer is tightened around the bushing.

The Universal splicer can be used in the standard furnished, which can be bolted to a bench, or it can be set in a vise or held in the hand. Further information on this unit may be secured by interested wire-rope and cable users direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

New WPB Ruling Covers Deliveries of Bulk Cement

In order to conserve railroad box-car space, badly needed for the movement of grain and other essential commodities, the War Production Board has extended the controls of General Haulage Conservation T-1 to bulk deliveries of portland cement. Schedule 1 to the haulage conservation order, which became effective on September 24, established more than ninety zones outside of which portland cement of given specifications may not be shipped by rail in lots of 20,000 pounds or more, except with prior authority of the War Production Board. Out-of-zone deliveries for the Army or Navy may be made upon a prescribed certification, signed by a duly authorized officer. All such deliveries, however, must be reported to the WPB within ten days of shipment.

No accurate estimate of the number of ton-miles to be saved by the new schedule is available but WPB officials state that substantial relief will be afforded railroads by curtailment of excess and cross hauling of cement.

Repair Parts for Trucks

Truck owners and operators will receive increased help in finding needed repair parts during the coming months through the efforts of the Maintenance Specialists in its 142 district offices, the Office of Defense Transportation has announced. In addition to spreading the greatly expanding flow of new parts scheduled for production, the Maintenance Specialists have access to the lists of interchangeable parts used in many types of trucks and will undertake to locate needed parts through ODT Maintenance Specialists in other cities, through parts manufacturers, and through the cooperation of the WPB, as well as through the local channels afforded by the industry-wide membership of local district maintenance advisory committees and subcommittees.

ODT pointed out that although materials assigned to parts manufacturers have been greatly increased, there is still a big problem in getting particular parts to the areas where they are most needed. The local Maintenance Specialist therefore may be of assistance in locating the needed part in some other area where it is available.

To prevent avoidable lay-up of trucks, operators unable to find needed parts are urged not to delay getting in touch with their local Maintenance Specialist at the nearest district office of the Office of Defense Transportation.

Listen, Americans—the jingling silver and green bills in your pockets can be transmuted by the National War Fund to loving services, given as brother to brother, that the burden and stress of this war may be borne equably by all freedom-loving peoples.

Timber Arch Bridge Replaces Old Trestle

Multnomah County, Ore., Builds Economical Span To Carry City Street Over Interurban Car Line

By A. R. FAIRBANK, Bridge Engineer, Multnomah County, Oregon

✦ TO replace an old frame trestle carrying the traffic on S. E. Tacoma Street in Portland, Oregon, over the Portland Electric Power Co.'s interurban line to Gresham, a timber arch bridge was constructed by Multnomah County. The reasons for the choice of an arch were: the setting accommodated that type of structure; in case of future abandonment of the interurban line, no obstructions would be encountered if the right-of-way was transformed into a highway; and its pleasing appearance. A three-hinged arch was selected as it could be erected without falsework, and was therefore economical.

Design of Structure

The bridge is 132 feet long, has an arch span of 88 feet, and is designed for an H-15 loading. Each end of the bridge is supported by a concrete abutment and one frame bent resting on concrete pedestals. The arch footings are of concrete on gravel. The three-hinge spandrel-braced arch is divided into eight 11-foot panels. The two trestle spans at each end are the same length, providing a symmetrical outline. The depth of the trusses is 21 feet at the seat, and 3 feet 6 inches at the crown. The parabolic lower chords have a rise of 18 feet and are spaced 18 feet apart, center to center. All joints are connected with Teco split rings.

The upper chords, arch ribs and verticals are made up of two members each, with a filler between, making an H-section. The fillers are continuous and are as long as the joint details would admit. Four rings were placed in each end and two in the center of each filler. The members are bolted together through the filler at about 2-foot centers throughout the length of the filler, resulting in a very stiff compression member. The diagonals are of one piece and at the joints fit between the chords, while the verticals are placed on the outside.

The floor beams rest on the upper ends of the verticals which project above the upper chords. A ½-inch bearing plate is inserted to distribute the load. In this manner, the loads are carried directly to the arch ribs without inducing bending stresses in the upper chords. This construction also allows the upper chord to be made straight, thereby simplifying splices. Each side of the upper chord was made up of one long and one short piece of 4½ x 14-inch material. The splices were then made in adjacent panels and at each splice one member was continuous. Teco ring connectors in the filler made a splice having the necessary strength.

The lateral bracing on the upper and lower chords are connected by 2½-inch rings. On the verticals they are fastened by ⅜ x 7-inch lag screws, the vertical side members not being thick enough to accommodate rings.

The deck is of 4 x 10-inch plank fastened to the stringers by ⅜ x 8-inch lag screws. The roadway is 24 feet wide and has a 2-inch non-skid wearing surface of asphaltic concrete, with a 9-inch curb and a 3-foot sidewalk on each side.

Erection

All members of the bridge were carefully detailed and fabricated before treatment. The trusses were then assembled near the abutments. It was

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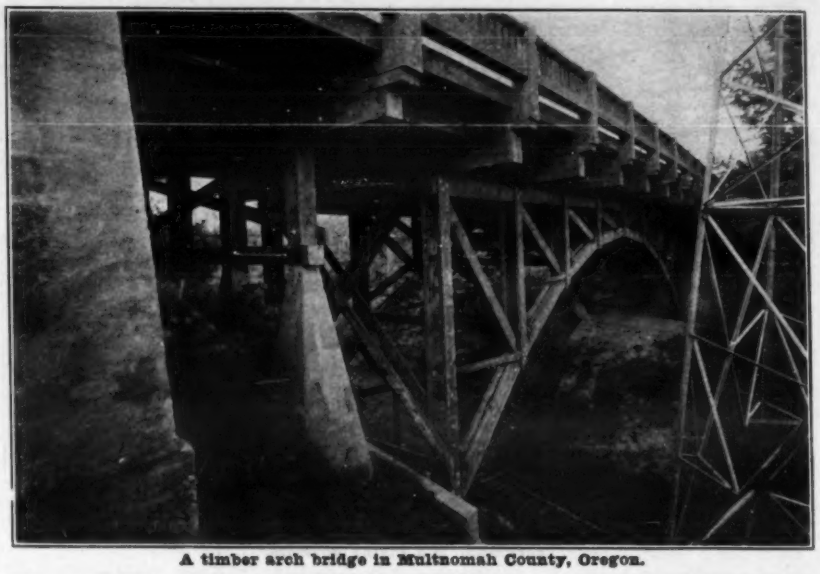
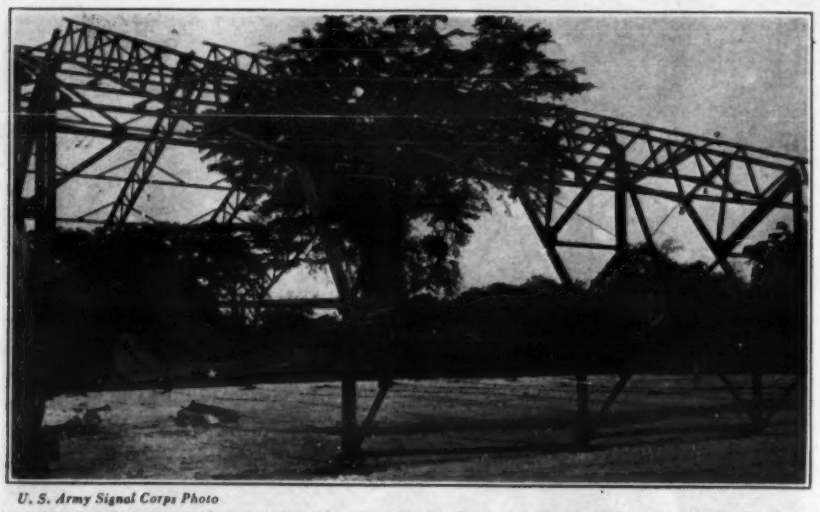


A timber arch bridge in Multnomah County, Oregon.



U. S. Army Signal Corps Photo

A combat hangar under construction by the U. S. Army Engineers somewhere in the South Pacific. The level floor and surrounding area for the hangar is of coral and in the background is a Flying Fortress.

Illinois Safety Record During Spring Floods

In spite of the magnitude of the spring floods in Illinois, which reached unprecedented heights and resulted in potential causes of g.. . disaster, not a single fatality attributable to the flood occurred on an Illinois highway, according to the July-August issue of the Illinois *Safety Bulletin*. This record was achieved in the face of undermined pavements, bridges washed out, and many earth slides covering part or all of the traveled way in hundreds of places.

The *Bulletin* points out that this remarkable record is not just a circumstance; its reason lies in the fact that there was an organization in being, trained through the years as a team, imbued with the idea of service to the public, and always vigilant to the idea of safety. Immediately on the first hint of trouble, the previously prepared disaster-control plan of the Illinois Division of Highways went into effect. Field forces marked the edges of flooded pavements, barricades were erected, and watchmen were posted on a day and night schedule when the flooded areas became impassable to traffic. Where water was not deep enough to bar traffic but was sufficiently deep to create a real traffic hazard, vehicles were convoyed through the flooded areas by state highway trucks. In several locations, sections of the highway were barricaded and used as storage areas for equipment, stock, and personal belongings evacuated by flood victims.

In highway districts comparatively unaffected by the flood, pools of equipment and men were established and held available to reinforce the effort at critical points. The central office and the various district offices were put on a 24-hour basis, and information on road conditions was supplied to the public throughout the state, thus detouring traffic around dangerous areas and reducing the number of vehicles subjected to hazardous road conditions.

The *Bulletin* also points out that, essential as a well-thought-out plan is in handling such an emergency, a full measure of success is obtained only from a strict loyalty to duty by all who put such a plan into operation. Many worked day and night, and the men who did the actual labor were just as important as their leaders. None asked for any special reward for their extra work.

New Lubricating Oil For Diesel Engines

The development of a new detergent-type lubricating oil designed to reduce wear and assure engine cleanness and oil stability for low-speed diesel engines has been announced by the Standard Oil Co. of Indiana, Chicago, Ill. The detergency of this new oil results from the use of an additive which is both a detergent and an oxidation inhibitor.

Carbon and other products of oxidation, as well as dirt, stick to each other and to engine parts, becoming deposited in rings and on valves, and clogging filters. With this new detergent-type oil, a film coats the carbon and dirt, prevents the particles from sticking, and holds them in suspension until they are trapped by a filter or drained from the engine, according to Standard Oil engineers.

Many engines give clean operation with conventional oils, but where dirty operation cannot be corrected by mechanical adjustment, the new detergent-type lubricating oil can be used, Standard Oil engineers state, pointing out that this new oil will, under these conditions, prevent ring-sticking, piston scuffing, and excessive sludge and gum deposits.

Universal Power Moves

Announcement has been made by the Universal Power Corp., Cleveland, Ohio, of its removal to 4897 Euclid Ave., Cleveland 3, Ohio.

Ohio Changes Methods Of Winter Maintenance

Snow-Plow Blades Held Clear of Pavement; Raw Chemicals Used to Melt Packed Snow and Ice

By H. D. METCALF, Chief Engineer, Bureau of Maintenance, Ohio Department of Highways

✦ OHIO'S effort to conserve snow-plow blades last winter, by holding them clear of the pavement surface to prevent excessive wear, meant leaving a thin layer of snow which might prove hazardous to traffic. As a result, it was necessary to change the customary practice of handling snow and ice. In general, this change has been toward greater use of raw chemicals, at the proper time, thereby reducing the use of chemically treated abrasives such as cinders or sand.

Ohio, as many other states, was faced with the additional burden of maintaining free and safe movement of war traffic, especially in industrial areas. This traffic included not only the movement of heavy war materials but also the movement of war-plant operating personnel. This meant that the Ohio Department of Highways was on the alert twenty-four hours daily, seven days a week, during the snow and ice season.

The experience of Ohio might prove valuable to other states. However, it must be remembered that winter conditions in this state may vary considerably from states in other sections of the country.

Weather Conditions in Ohio

Generally Ohio is not faced with the problem of excessive snows such as might be encountered in Minnesota or some of the New England states. Reports from the Weather Bureau show that in the southwestern portion of Ohio the total snowfall in the winter averages 20 inches or less, and in some years it has been as low as 2 or 3 inches for the entire winter. At the same time, certain northeastern sections of the state average over 60 inches of snowfall in one year. It is rare for any one snow storm, through the major part of the state, to precipitate more than 3 inches of snow. Another very common winter condition is for rain to freeze on the pavements, forming a glaze of ice, which is very hazardous to traffic and extremely difficult to combat.

Ohio has extreme variations in climatic conditions. Contacts are made with the Weather Bureau to obtain confidential forecasts which often assist in the plan of attack in storms of a more general nature. In addition to this, most of the Divisions have barometers which aid in forecasting the weather.

Change in Procedure

In pre-war years it had been customary to get out with snow plows and plow with the storm, clearing the pavements as cleanly as possible. This necessitated riding the snow-plow blade on the pavement itself, a practice resulting in a high replacement cost for snow-plow blades. The slight amount of snow that was left on the pavement was generally covered with a light application of abrasives, such as sand or cinders treated with salt or calcium chloride which served the dual purpose of preventing freezing in the stockpiles, and also causing the abrasive material to stick and embed itself in the hard-packed snow or ice.

In order to reduce wear on blades and conserve truck miles it was decided, last winter, to change the method of handling snow by plowing only the heavier snows and plowing with the snow blade clear of the pavement, following immediately with an application of raw chemicals, either calcium or sodium chloride. It was hoped that this would cause the snow to melt and leave ice-free pavements.

At left, an Ohio highway immediately after the application of rock salt and, at right, the results of a raw-chemical application, showing the highway clear of ice and snow.

The results obtained were satisfactory beyond expectations. Experience had indicated that in Ohio most of the snow actually falls at temperatures between 28 and 32 degrees, and that lower tempera-

(Concluded on page 57)

Big Hydraulic Dredge Places Airport Fill

(*Continued from page 9*)

line, a walkway of two 2 x 8-inch planks is laid on top of the pipe and a safety hand-rail set up on one side. The telephone line for communicating with the shore is carried along the hand-rail.

When the first section of the submarine cable arrived, the overhead lines were discarded and the 4-inch diameter cable placed in service. This was furnished by the American Steel & Wire Co., and at the time of manufacture was the largest diameter of submarine cable made. The dredge is operating with 6,500 feet of the cable, while another 4,500 feet is being repaired. An additional 5,500 feet of cable of the same type was purchased from the Okonite Co.

The cable comes up from the bottom at the cable reel barge moored 60 feet aft of the dredge. This 20 x 50-foot steel barge carries a 35-foot circumference reel, which carries any slack cable not needed to reach the shore and holds 1,050 feet of cable per layer as wound on the reel. The reel has to be rotated very slowly to prevent damage to the cable. This is accomplished by a Ford V-8 engine with double transmission giving a choice of 12 speeds. The power from the cable is taken off through the central shaft leading to three collector rings connected to three separate feeders for the 3-phase current. These are carried as overhead cables 60 feet to connections protected from rain at the stern of the dredge. The reel barge also has an oil switch for cutting off the current safely.

A Continental motor direct-connected to a Dayton-Dowd pump furnishes water to wash the mud off the cable as it comes up off the bottom onto the drum. Valves permit the use of this same outfit to pump bilge water from the barge.

The Nebraska

The Nebraska has a 68-foot ladder carrying the 6-blade toothed cutter head, which has a back ring 62 inches in diameter and a 34-inch suction. It can work to a maximum depth of 50 feet or 45 feet when working on a 45-degree angle. The cutter is turned by a 500-hp General Electric motor running at 27 rpm. The ladder carries an automatic depth indicator so that the dredge operator knows at all times just how deep he is working.

Roebling 1⅛-inch prelaid plow-steel cable is used on the ladder and 1¼-inch for the swing cables. The swing lines from the swing drums are carried through fairlead sheaves to the upper and lower ends of the ladder and thence to the swing anchors. This pair of anchors weigh 5,000 pounds each and are carried 150 feet to the side and just back of the ladder head to prevent damage to the cutter head when the limit of the swing is reached. The swing on this dredge is normally 270 feet or 135 feet either side of the center line.

Renewable cutting blades are used on the cutter head, and in the sand in which they are now working they are changed every two months. The cutter drive shaft is made in five sections with flange-type couplings. The shaft bearing in the suction head is a water-lubricated rubber "cutless" bearing.

The entire operation of the dredge is controlled from the deck house, where the various levers for the hydraulic controls of each motor, hoist, or other piece of machinery involved in the operation of the dredge are located. Brake valves are operated by foot and the clutch valves by hand. Gratings in the floor of the deck house permit the dredge operator to see how the cables are running on the winches below.

A hydraulic pump in the deck house provides the oil pressure for the hydraulic controls. It is run off the electric line or by current from a Cummins diesel-electric generating unit on the main deck. This auxiliary is run when the current is not coming from shore and can furnish enough power to run the bilge pumps, the ladder hoist, or the spud hoists. The generator is a Westinghouse unit, and another of the same make is located at the end of the shaft to furnish current for the lights.

A 5-drum hoist on the main deck does most of the work except driving the pump and is powered by a 150-hp General Electric motor. The middle drum is the ladder hoist, the two adjacent drums on either side are the swing hoists, and the outside drums are the spud hoists. The two stern spuds are steel cylinders 40 inches in diameter and 75 feet long. The port spud next to the discharge-line ball joint at the stern is the digging spud. The other is used for "walking" the machine ahead.

The dredge is equipped with a single-suction centrifugal pump driven by a 4,000-hp General Electric induction motor. This pump develops from 6 to 28 inches of vacuum, and if it runs up too high because of a blocking of the suction pipe, the vacuum can be broken by stepping on a pedal on the control stand in the deck house which opens

(*Continued on next page*)

C. & E. M. Photo
Repairing the inside of a pump face plate on the repair barge alongside the dredge Nebraska.

The 30-Inch Nebraska Is An All-Electric Unit

(Continued from preceding page)

four small gates on top of the suction to admit water. This breaks the vacuum so that it drops down to 16 inches immediately and then starts building up again.

The pressure in the discharge line runs up to 120 pounds at the pump. Both the vacuum and the pressure are recorded in the deck house as well as on gages in the engine room for the benefit of the dredge operator and the engineer on duty.

On the top deck aft of the deck house is a novel rig which has paid its way continuously. It is a boom with a 15-ton hook operated by a 2-drum hoist driven by a Waukesha gas engine. This outfit is used to remove the main pump and main motor for overhaul through three wide hatches in the top deck. A hand winch is used to swing the boom. A 20 x 80-foot repair barge is moored alongside the dredge at all times, and welding electrodes are run out from the dredge for the use of the welders. Two welders are used on the day shift and one at night.

On the Main Deck

For the comfort of the crew there is an electric water cooler on the main deck, fed from a 275-gallon fresh-water tank located on the top deck for pressure. For moving barges and handling other work, there is a nigger head outside on either side forward.

Machine-shop equipment is tucked in at odd places, both on the main deck and below, for the repair of any part that might need servicing. On the port side just forward of amidships is a 24-inch x 6-foot Lehmann lathe and a Rockford drill press. On the starboard side aft is a machinist's bench with a Black & Decker buffer and grinder. Nearby is a Walker-Turner buffer and grinder.

The main pump is a 16 x 76-inch diameter unit with a 4-vane impeller. The impeller wears rapidly from the abrasive sand, and the throat rings, impeller, and liner plates have to be removed every week and built up with Manganal welding rod. The impeller is of a chrome-steel alloy but still shows wear from the scouring action of the sand. The set-up of the pump and motor is well planned to prevent undue thrust on any bearing. Aft is a Kingsbury thrust block and then successively three collector rings for the 3-phase secondary current leading to the G-E liquid slip regulator which governs the speed of the 4,000-hp General Electric motor, another Kingsbury thrust block, the flange coupling between the motor and impeller shafts, the Kingsbury main bearing, the main pump, and in front a suction manhole or emergency hatchway for access to the pump.

Texaco lubricants for the various pieces of equipment are stored on the main deck with additional storage below. An oil pump is used to circulate the oil to the bearings after it has been preheated to 94 degrees F. Also aft on the main deck are three General Electric transformers in a triangular hook-up for the 3-phase current. Two Allis-Chalmers service pumps with A-C motors are installed with a valve arrangement permitting hook-up for any possible service from bilge pumping to fire protection. The dredge is amply protected by chemical fire extinguishers well distributed over the decks. Four tanks of C-O-Two extinguishers are located at the main motor, another pair at the fuel tanks, and Pyrene guns are handy at many other locations. Fire hose and water standpipes are located at several points on both the main and upper decks.

Below Deck

The space in the hold between the bulkheads dividing the hull into its nine sections is used for the storage of repair parts and materials required constantly on the dredge. There are no sleeping quarters on the dredge so that all space is available for equipment and service. The spud cables from the outside drums of the 5-drum hoist are carried from the forward part of the dredge in troughs below deck to prevent

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Engineer Training For Varied Activity

(*Continued from page* 16)

to learn his part in his unit's employment. By the end of the thirteenth week of organizational training, the unit is ready for action overseas.

The E.U.T.C.

The Engineer Unit Training Center, which has received a large share of the enlisted specialists, is so titled because of the type of military schooling there. Members of each E.U.T.C. Engineer organization serve together through most of their training, and go overseas in the same group. Thus, unit integrity is maintained throughout the training period and into active service. The E.U.T.C. has been commanded, since its organization in April, 1942, by Brigadier General John W. N. Schulz.

Many types of Engineer units are trained there, including general and special service regiments for skilled construction work in the theater of operations; heavy shop companies for fourth echelon maintenance work on engineer equipment (the more serious repairs); maintenance companies for on-the-spot repairs of Engineer equipment; equipment companies who keep on hand heavy Engineer equipment for use by construction units as needed, providing operators if necessary; depot companies, for the supply of Engineer material at base headquarters; forestry companies and battalions, sawmill units that provide small and medium-size construction lumber in the theatre of operations; dump-truck companies for hauling bulk Engineer material for construction uses, such as gravel, sand, etc.; parts supply companies, to provide spare parts for Engineer units; petroleum distribution detachments, to operate portable pipelines for distribution of petroleum products; fire-fighting platoons, small units for use at a depot or other base; and gas generating units for the manufacture and supply of oxygen, nitrogen, and acetylene gas to Engineers and other troops, such as hospital units.

This article was prepared by the Public Relations Officer at Camp Claiborne, La., in collaboration with Private Charles J. Schmeizer, one of the volunteers undergoing training at that camp.

Low Speeds Greatest Help To Conservation of Tires

Strict observance of the national 35-mile speed limit offers the greatest aid in keeping the country's cars rolling for another year, according to a report by the Public Roads Administration on a four-year investigation of passenger-car-tire wear and tire failure.

In listing speed as the most important factor in determining the rate of tire wear, the investigators noted that, on the basis of relative wear, tire mileage at 65 mph would have been about 18,700 as compared with 56,500 miles at 35 mph and 69,500 miles at a maximum speed of 25 mph.

In the present emergency, highway engineers can aid in tire conservation by reducing the abrasiveness of road surfaces. Highways and streets should be kept in good repair, free from nails, glass, holes, and sharp edges which cause punctures and blow-outs, it is pointed out.

Strict compliance with restrictions of the tire conservation program is necessary to keep the wheels of essential traffic rolling until adequate supplies of new tires are available. The major items in this program include a national speed limit of 35 mph, recapping of tires at the proper time, mileage rationing for essential travel, and periodic inspection of tires. Other measures recommended for car owners are: start and stop slowly, reduce speed on sharp curves and steep hills, check tire inflation each week, and keep loads within the rated capacities of the tires.

Results of the investigation which was conducted jointly by the Engineering Experiment Station, Iowa State College, Ames, Iowa, and the Public Roads Administration, Washington, D. C., are presented in a pamphlet "Tire Wear and Tire Failure" prepared by R. A. Moyer, Research Associate Professor of Highway Engineering at Iowa State College. The pamphlet is now being published and when available, copies may be obtained from the Public Roads Administration without charge.

Road Work by Prisoners

The use of prisoners of war who were road construction workers in their own country to help state highway departments overcome the growing man-power shortage has been suggested by the Provost Marshal's Office.

New Traffic Striping Developed in Britain

Need for Substitutes to Take Place of Critical Materials Led to New Compositions; Results Studied

✦ SOON after the outbreak of war in Europe, it became evident to British highway engineers that the materials used in normal quick-drying road paints, including white pigment, manilla gum, and alcohol, were likely to be scarce, and alternatives were therefore sought, particularly in view of the increased importance of road markings as aids to traffic movement in the blackouts. Alternative paints have been considered by a subcommittee of the British Standards Institution, and a revised specification has just been issued. Substitute materials other than paints were also considered and plastic white-line compositions and surface-dressed white lines have been developed by the British Road Research Laboratory in cooperation with the Ministry of War Transport.

The present three classes of substitutes for the pre-war road paint, alternative traffic paints, plastic white-line compositions, and surface-dressed white lines, were described in a recent issue of *Roads and Bridges*, of Toronto, Canada, based on the British Road Research Laboratory's Wartime Road Note No. 6 (Crown copyright reserved).

This report states that the whiteness of the alternative traffic paints is good when the paints are first applied but it deteriorates throughout their life which, under average conditions, is one month in winter and two months in summer.

Plastic Markings

It is also reported that lines made with plastic white-line compositions are never as white as a freshly painted line, but they are as white as a line of pre-war quality paint after a few weeks of use and maintain their whiteness well throughout their life. It is important to note that their visibility at night depends largely upon their surface texture.

These plastic white-line compositions are thermoplastic materials applied hot to the existing road surface and harden rapidly on cooling. They consist of a mixture of fine mineral aggregate and white pigment bound together by a thermoplastic binder, and are reported to have the advantage over road paints containing spirit that they require no volatile solvents. A nominal thickness of 3/32 inch is employed. Although this is considerably thicker than the normal paint film, the amount of white pigment used per year of upkeep is still comparable with that needed for painted lines which are repainted five or six times a year. The normal procedure in England is for the highway authorities to purchase the white composition already mixed from the manufacturer, but they can easily prepare it themselves if they wish.

Plastic compositions are recommended for use on bituminous surfaces in rural or urban districts. They should be applied in warm, dry weather, to a clean, dry surface, to insure proper adhesion. The composition is reheated on the road to between 260 and 300 degrees F., using a clean tar kettle or similar heating unit, and is applied in a hot fluid state by a scraper device.

Generally these plastic white lines have proved durable and weather-resistant. Provided the lines are laid under suitable weather conditions, a useful life of at least a year may be expected; in favorable circumstances a service life of eighteen months has been obtained. Although this type of line withstands normal heavy traffic, it is not resistant to steel-tired or tank traffic. The material lasts best when applied to a medium or open-textured surface, but is not so satisfactory when applied over a painted line or on a smooth surface. If applied to paving blocks, where the joints are not flush, the material breaks away.

Surface-Dressed Lines

Traffic lines consisting of a strip of light-colored aggregate held to the road by a tar binder in the manner of a surface dressing have been developed with the objective of obtaining a line from entirely home-produced and readily available materials. Such lines may be laid either by machine or by hand, in continuous or intermittent form. As with other lines, their success depends upon the amount of light reflected back, and it is therefore important that the surface texture of the line not be smooth. Care in preparing these lines is essential. If too much binder, or a binder of too low a viscosity is used, the life during hot weather may be short. On soft road surfaces, blackening due to binder covering the stone is more rapid than on hard ones.

The visibility of surface-dressed white lines depends, in daylight, upon the color of the stone used in relation to the color of the road surface, and in some cases the whiteness of the line appears poor by day in comparison with a new paint line. However, at night, the brightness depends upon how much light is reflected back to the driver, and a surface-dressed line that is relatively poor by day may show up well at night.

As a result of a year's experimental work, it is expected that, with proper selection and use of material, surface-dressed lines laid in the summer will last throughout the following winter on roads where the intensity of traffic is not great.

Comparison of Costs

No general comparison of costs of these various types of traffic stripes can be given, but on a yearly basis it is reported that plastic lines and surface-dressed lines are not more expensive than paint, provided surface-dressed lines have a life of one year, plastic lines a life of eighteen months, and painted lines a life of two months.

Write your check for the National War Fund now. No money that you ever invested anywhere will bring you the returns this money will! Remember, the same check helps to supply the needs of our own boys, through such organizations as the USO and the United Seamen's Services, as well as of our Allies.

R. G. LeTourneau, President, and Donn Burgess, General Manager, of R. G. LeTourneau, Inc., inspect the 1,000th C Tournapull as it came from the assembly line. This unit is now in action with our armed forces.

Moving 375,000 Yards Of Snow at an Airport

At the Allegheny County Municipal Airport near Pittsburgh, Pa., last winter, it was necessary at one time to move 375,000 cubic yards of snow from the runways, taxiways, and other paved areas. That is the problem faced by all airport managers in the snow belt unless they are far enough north to resort to rolling, as was formerly done at Pittsburgh. In such places the snow is allowed to accumulate until the end of winter, when thawing aids plowing to hasten removal all at one time.

At Pittsburgh, two Walter Snow Fighters with V-plows and wings and underbody blades, all hydraulically controlled, do all the runway clearing. This has been so effective that in the winter of 1942-43 there was no time when planes could not use the runways for take-off or landing.

The plowing is carried 150 feet wide and for a distance of about 18,000 feet to clear all the runways. This is equivalent to plowing nearly 27 miles of standard 20-foot highway. The underbody blades are used to scrape off snow not removed by the V-plows, while the wings feather off the piles at the edges of the runways.

The runways are paved at least 150 feet wide and at some places as much as 500 feet, because the Allegheny Airport has practically no grass areas. It was built in 1930-31 by moving two large hills into the valley between and surfacing much of this rock fill with slag. (C. & E. M., October, 1931, page 55.)

This means that summer maintenance is devoted mainly to the care of the drainage system.

The removal of snow from runways and other service areas at the Allegheny County Municipal Airport is done by the County Department of Works, J. B. Sweeney, Director. Twing Brooks is Director of the Airport.

New Safety Helmet

A new hard hat built to give three-way protection to its wearer, yet with the weight kept to a minimum, has recently been announced by the Davis Emergency Equipment Co., Halleck Street, Newark 4, N. J. The top of the crown of this Davis Hedgard is reinforced for direct blows; the side of the crown is made to stand glancing blows; and the brim is flexible yet strong so that it will not crack when dropped. As a result of new moulding and compounding processes, the Hedgard is shatterproof, offering the wearer additional protection, as there is no chance of its splintering and a part of the crown protruding into the head.

The manufacturer states that a blow is first absorbed on the crown which has a "give and deflect action"; and it is further absorbed in the new cradle and sweatband construction which acts as a shock absorber. The sweatband is replaceable and may be washed in water or dry cleaned. The whole Hedgard may be sterilized with steam.

Further information on the new Davis Hedgard may be secured direct from the manufacturer by referring to CONTRACTORS AND ENGINEERS MONTHLY.

Businessmen of Texas Aid Mexican Road Work

According to a report from the Office of the Coordinator of Inter-American Affairs, the Governor of the State of Tamaulipas, Mexico, has informed President Avila Comacho that businessmen of Brownsville, Texas, have offered to supply machinery for the construction of a highway between Matemoros, just across the border from Brownsville, and Ciudad Victoria, in Mexico. The road would link Brownsville with Mexico City and the Pan American Highway by the most direct route.

Access to War Plants Provided by New Road

New Four-Lane Concrete Highway in Oklahoma Completed, Despite Delays, By Moran & Buckner

By O. D. HALL

+ AN important four-lane access highway designed to carry a large part of the heavy traffic between two large war plants in Oklahoma and nearby urban areas has been completed despite many unavoidable handicaps imposed by bad weather, temporary labor shortages, transportation difficulties, and scarcity of critical materials.

The highway, consisting of two 22-foot concrete pavements on either side of a 4-foot wide central dividing strip, is 6.127 miles long, and is designed to carry vehicles transporting approximately 20,000 persons daily, aside from its service as part of the Federal highway system. Two privately owned housing projects, constructed to serve war workers and financed with Federal aid, also lie along the route. The 4-foot central dividing strip of the new highway is raised 3 inches, with a ½-inch crown, and is laid between 6 x 13-inch concrete curbs. The 22-foot concrete slabs on either side slope to the outer edge ⅛ inch per foot. Reflector buttons are installed in the edge of the dividing strip every 40 feet. At each end of the project traffic lanes are divided by islands, with black arrows built into the surface of the pavement to direct traffic.

The highway traverses comparatively level ground. The single strip of asphalt paving which had been laid many years ago met all normal demands as a two-lane highway until the growing population, resulting principally from the rapid influx of war workers, made necessary the widening of the highway, as well as the construction of several parallel and lateral roads leading into the main artery.

Preparation of the Grade

The contractor started the work by removing the old pavement which was stockpiled at the side of the road. A part of the asphalt, the old concrete base, and some of the gravel were salvaged. The old 30-foot roadway was widened to 68 feet and the vertical curves were lengthened. At one end of the project, where the work was started, heavy red clay was encountered, while at the opposite end of the grade the soil was slightly sandy with some sandstone. Several heavy rains during this period to some extent slowed grading operations, which were handled by LeTourneau scrapers and a Northwest shovel. Cuts and fills were balanced, and when extra material was needed, the soil from the widened cuts was used.

A Surgrader was used in the preparation of the subgrade, and the fine grade in front of the paver was sprinkled and compacted by sheepsfoot rollers. An average of 18 per cent moisture was maintained in the grade, either through rains or sprinkling. Water was piped from the supply of a nearby oil company.

Form trenches were cut by a Carr Formgrader, and standard methods used in form setting.

Types and Setting of Joints

Expansion joints ¾-inch wide were placed every 90 feet, with contraction joints every 30 feet. The expansion joints were poured with hot rubber until the supply of rubber gave out, and then with asphalt. The contraction joints were cut 2 inches below the top of the slab and poured with hot rubber or asphalt.

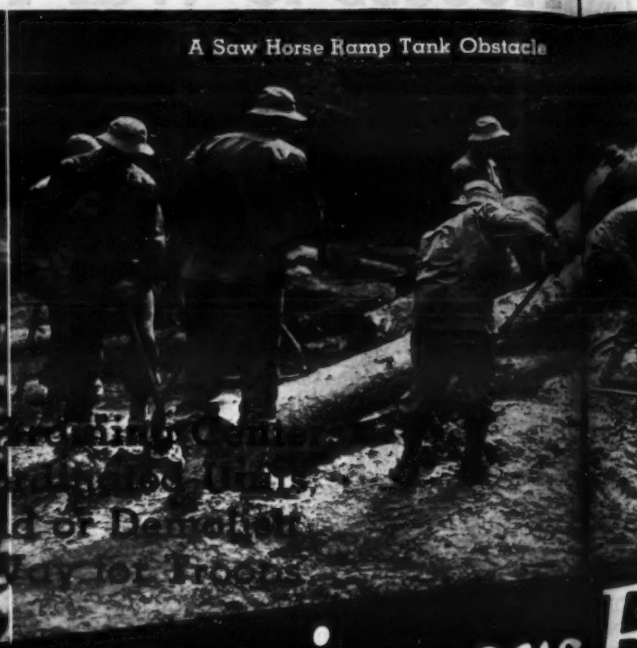
Batching Methods

The batching plant with Johnson bins was located 2 miles north and near the center of the project on a railroad line with spurs built by the contractor for unloading the aggregate and cement. The rock was obtained from Richards' Spur near Lawton, Okla., and sand was shipped by rail from Dover, Okla. The cement, from a plant in Ada, Okla., was shipped in bulk and unloaded from the

(*Concluded on page 62*)

The bucket of the MultiFoote paver delivering a batch of concrete to a four-lane access road leading to vital war plants in Oklahoma.

Erecting a Tank Obstacle



A Saw Horse Ramp Tank Obstacle

Training Army Engineers F

Preparing a Dynamite Charge

Dirt-Moving Operations

Building a Ponton Bridge

Erecting a Standard Trestle Br

A Salute to Cstru

* Six months after it was issued, the ructi than met its latest and toughest war lenge 15, it has put into the uniform of the ps o specialists to complete the job of Ame a mil

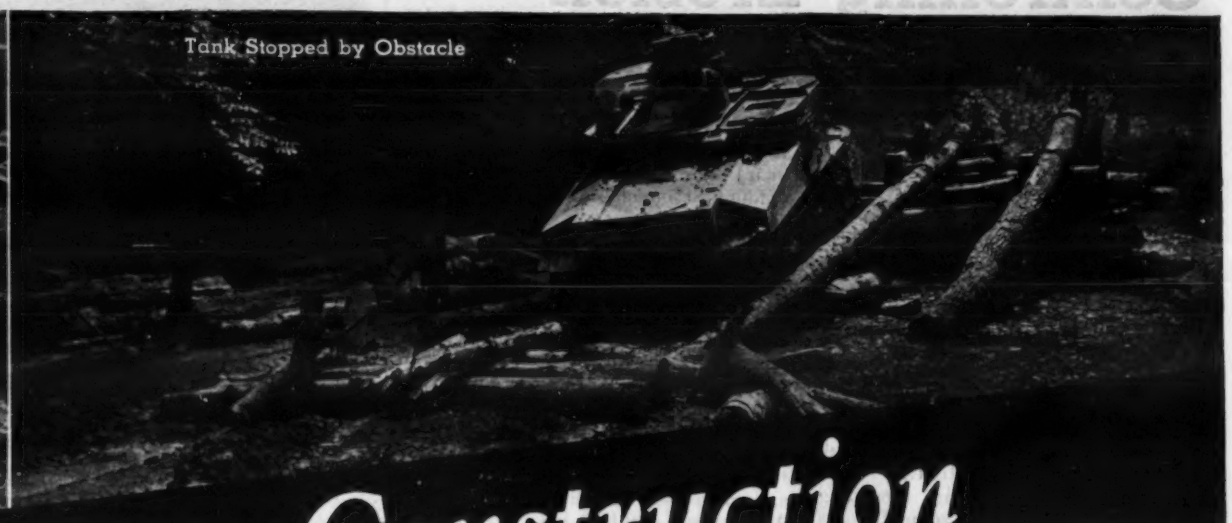
* These men are volunteers. Those are for reclassification to 1-A so that the ould total number brought in through pers inte Corps of Engineers cannot be revealed it industry more than met set quotas.

* The Corps of Engineers states that fac construction workers. Major-General Re R no promises, except to say, "Yes, we're gh, struction men knew what he was talki about they like.

* Newly activated Engineer units, whic specialists will fill key spots, are now ing bases the kind of construction which e 194 into the Arsenal of Democracy.

* In theaters of operation they will ertak construction tasks as bridging, cons n a railroads, provision of port and loadi ciliti advance landing fields, the maintes and in fact, the construction, repair, and enan assigned specifically, like Signal Co comm

* It's an assignment where work-po will big job; but the American constructio dustry



Tank Stopped by Obstacle

rs For Overseas Construction

U. S. Army Photos

to Construction Men

d, the truction industry of America has more war llenge. From March 15 to September of the ps of Engineers enough construction f Ame military construction overseas.

Those are of draft age voluntarily appealed hat they ould be eligible for induction. The h pend interviews in regional offices of the evealed it can be said that the construction tas.

tes that fact is a salute to the patriotism of neral Reybold, Chief of Engineers, made , we're gh, and we may get tougher". Con- as talki about. It was the type of challenge

units, which these volunteer construction are now ing trained to carry on at overseas which e 1940 has turned the United States

y will ertake, aside from combat, such major , constion and repair of military roads and loadi cilities, construction of air bases and aintena and operation of inland waterways; , and nenance of all types of structures not nal Co communications, to other Army units.

work-po will be as vital as fire-power. It's a truction dustry provides good soldiers.

Searchlight on Road

Setting a "Booby Trap"

Penetrating Barbed Wire

Garnishing a Camouflage Net

Rock Drill Instruction

Controlling Erosion On Indiana Slopes

Failures on Previous Work Provide Helpful Lessons For Present Economical Wartime Projects

(*Photos on page* 68)

✦ THE manner in which older backslopes have held up provides the schooling for erosion-control methods on wartime work when there is neither time nor money for experiments. Mankind learns by his failures, so here, through the kindness of Henry J. Schnitzius, Landscape Supervisor, State Highway Commission of Indiana, we are recording some interesting failures, some failures that were checked by the control methods which have been installed, and other effective practices which have developed as a result of past experience in Indiana.

Stabilizing Slides

Several years ago, employing CCC labor, the State Highway Commission of Indiana did considerable experimental work on erosion control on U. S. 52 along the by-pass section near Lafayette, the seat of Purdue University. On one section locusts were planted on a 1 : 1 slope to control slipping. From the top of the shoulder to the beginning of the locust planting, the ground was sodded and a mulch spread over the area and tied down. This section is on a long grade with heavy truck traffic running between Indianapolis and Chicago. Because of this, a third lane was added at the right, or upgrade side, with a paved side ditch with gratings for drainage at intervals of 240 feet.

The value of the locust planting is shown effectively by the fact that a slide which started at the shoulder on the north side of the road and continued for about 20 feet was checked by the locust. On the south side of the road, opposite this slide, an earlier slide had developed, but later plantings of locust had tied that down effectively so that there was no recurrence of the slipping.

Along this same area above the locusts, prairie rose was planted to tie down the top soil. Plantings of locust were also used on the 1 : 1 cut slopes and effectively prevented erosion. Among the locusts, in the early plantings some five years ago, there was a considerable amount of mulch seeding, which effectively held the ground until the locusts developed.

One piece of experimental work which failed in this section, on the north side of the road, is worthy of record because it shows that natural means are much more effective in erosion control than mechanical means. Near the top of the slope, where there was little soil, it was decided to install a half corrugated-culvert pipe transversely across the slope with a gentle grade to catch the water and convey it to a definite water course. As there was nothing above to bind what soil and gravel existed on the slope, this material was washed into the half culvert pipe, filling it, so that it became an elongated spillway instead of a means of carrying water. This resulted in erosion beneath the culvert pipe for its entire length. Fortunately, a spreading of the locust has checked further erosion in this area, so that the damage caused by the culvert pipe has been eliminated.

A slide on the Lafayette By-Pass completely checked by the root growth of a locust planting at mid-height of the slope.

The mile-long upgrade section is a series of cuts and fills. It was very noticeable that the north cut banks, which face the south, carry through the winter in much better condition than the south banks, which face the north. This is undoubtedly due to the quicker melting of snow and the larger amount of sunlight reaching these areas.

Toward the top of the grade, which is entirely in cut, experimental work was done with the sodded slopes. In part, these were carried from the paved side ditch all the way to the top of the slope, a distance of some 80 feet, and in another section a bench 12 feet wide was made about three-quarters of the way up the 120-foot slope. Another section was planted by mulched seeding with and without the bench.

(*Concluded on page* 61)

The new LeTourneau Tiltdozer for D4 or R4 tractor with the blade corner tilted, widening and deepening a V ditch.

New Tiltdozer Has War, Peacetime Uses

Designed so that its blade may be tilted a minimum of 12 inches on either side or dropped parallel for straight bulldozing, the new A4 Tiltdozer just announced by R. G. LeTourneau, Inc., Peoria, Ill., operates with either the R4 or D4 Caterpillar tractor and LeTourneau Model T or Model HN power control units. The Tiltdozer-blade tilt is adjusted through a simple worm-gear-driven mechanism, manually operated by a crank, and equipped with a hand-set pin to hold the blade stationary.

This newest LeTourneau Tiltdozer was designed especially for the Army Combat Engineers, but will be equally useful on construction jobs. The manufacturer states that it is particularly adapted to digging V ditches, making initial cuts and passes, and dislodging stumps and other obstacles.

Further information on this new Tiltdozer may be secured by those interested direct from the manufacturer. Just mention this item.

New Adhesive Bonds Wood, Plastic, Metal

Post-war construction will include the use of many new materials and methods. A new binding process recently announced unites metals with a bond reported to be stronger than riveting or spot welding, and joins rubber, synthetic rubber, plastics, leather or wood to metal or to each other with a bond stronger than the materials themselves. This is the announcement of The U. S. Stoneware Co., Akron, Ohio, manufacturer of Tygon plastic materials and corrosion-resistant industrial equipment. This new bonding method, known as the Reanite bonding process, is already in use for vital war applications and is expected to find thousands of peacetime uses in uniting dissimilar materials.

An interesting application of this process combines the lightness and insulating value of plywood with the permanent strength and beauty of stainless steel. For example, thin sheets of stainless steel or aluminum can be bonded to Tygon-impregnated plywood to form a light-weight fireproof waterproof structural assembly for prefabricated housing units, boats, airplane or motor-car assembly, kitchen cabinets, refrigerators, etc. Composite metal and plastic parts may be molded; rubber and metal spring assemblies for smooth, soft, quiet, and vibration-free riding are a reasonable likelihood.

As an indication of the strength of this bonding method, laboratory and field tests are referred to, showing that it would require a direct pull in excess of 30,000 pounds to separate two 6-inch square pieces of steel bonded with Reanite. The manufacturer states that on standard tensile-testing machines Reanite develops a bond, metal to metal, ranging from 1,000 pounds per square inch to as high as 3,000 pounds per square inch.

The application of the Reanite process is simple. The surfaces to be joined are brushed, sprayed, or dipped with Reanite. After drying, mild heat and pressure is applied. Further information regarding the applications of this process in all phases of construction may be secured by writing direct to the manufacturer and mentioning this news item.

No More Barricades Of Old Steel Drums

One of the handiest ways to barricade highway-widening projects or concrete paving is to "roll out the barrel" and put a line of old steel drums at the edge of the old or new pavement so that traffic will not injure the work. This practice will automatically come to an end by Amendment No. 1 to Limitation Order L-197, as amended, issued August 14 by the War Production Board. Under this amendment, used steel shipping drums which are suitable for reuse for packing either edible products or Naval stores products may not be used for any other purpose, even for barricades, but are restricted to the uses of those industries.

There are exemptions relating to steel drums used for shipments licensed by the Office of Economic Warfare, but these apply only to those drums actually used for export to points outside continental United States. While the use of new steel drums for packing turpentine is still prohibited under order, used drums may be employed for that purpose under the amendment.

New Mexico's Terms For Equipment Rental

(*Continued from page* 13)

"(1) Which is not in actual use for more than 48 hours during one weekly period, the maximum rental price shall be the rental price calculated upon the basis of the applicable rate 'per week' in the Table of Rates set forth in Appendix A, Table of Rates issued by the Office of Price Administration, dated Oct. 15, 1942;

"(2) Which is in actual use for more than 48 but not more than 96 hours during one weekly period, the maximum additional rental price for such additional use shall be the rental price calculated upon the basis of 50 per cent of such applicable rate 'per week';

"(3) Which is in actual use for more than 96 hours during one weekly period, the maximum additional rental price for the total additional use over 48 hours shall be the rental price calculated upon the basis of 100 per cent of such applicable rate 'per week';

"(4) Which remains in the possession of the lessee for a part of a weekly period beyond one or more full weekly periods, the maximum rental price for such part of the weekly period shall be the higher of the following: (i) 1/7th of the applicable rate 'per week' for each daily period, or part thereof, of possession or (ii) 1/48th of the applicable rate 'per week' for each hour, or part thereof, of actual use: *Provided*, that if such equipment is in actual use during such part of a weekly period for more than 48 hours, the maximum rental price for such part of a weekly period shall be the rental price determined in accordance with subparagraph (1) of this paragraph, together with subparagraphs (2) and (3) whichever may be applicable.

"(c) *Monthly Basis:* For any construction or road maintenance equipment leased by the month and

"(1) Which is not in actual use for more than 240 hours during one monthly period, the maximum rental price shall be the rental price calculated upon the basis of the applicable rate 'per month' in the Table of Rates set forth in Appendix A, Table of Rates issued by the Office of Price Administration, dated Oct. 15, 1942;

"(2) Which is in actual use for more than 240 hours during one monthly period, the maximum rental price for each additional hour, or part thereof, of actual use shall be the rental price calculated upon the basis of 1/480th of such applicable rate 'per month';

"(3) Which remains in the possession of the lessee for a part of a monthly period beyond one or more full monthly periods, the maximum rental price for such equipment for such part of the monthly period shall be the higher of the following: (i) 1/30th of the applicable rate 'per month' for each daily period, or part thereof, of possession or (ii) 1/240th of the applicable rate 'per month' for each hour, or part thereof, of actual use: *Provided*, that if such equipment is in actual use during such part of a monthly period for more than 240 hours, the maximum rental shall be the rental price determined in accordance with subparagraphs (1) and (2) of this paragraph.

"Par. 1399.3 *Rates most favorable to lessee.* Notwithstanding the provisions of Par. 1399.2, if any construction or road maintenance equipment is leased by the day and the rental price thereof calculated upon a daily basis exceeds the rental price calculated upon a weekly basis or upon a monthly basis, or if such equipment is leased by the week and the rental price thereof calculated upon a weekly basis exceeds the rental price calculated upon a monthly basis, the maximum price shall be the rental price calculated upon the basis most favorable to the lessee. This section shall apply even where the periods of rental are not consecutive, if the lessee in such case is willing to rent such equipment continuously and the interval between the termination of the initial period of rental and the commencement of the subsequent period of rental to the same lessee does not exceed thirty days. In such case, the maximum rental price shall be calculated as if the rental periods were consecutive.

"The Lessee by these premises acknowledges that he knows the condition of the equipment rented hereby, and in consideration of the renting of same to him by the State agrees at his own cost and expense to make whatever repairs are necessary to such equipment to restore it to first class condition; and further agrees that such equipment

(*Concluded on next page*)

Rental of Equipment Aids Road Maintenance

(*Continued from preceding page*)

will be maintained by the Lessee in first-class condition without cost to the State during the time that the Lessee has such equipment in his possession.

"It is mutually agreed that this agreement may at any time be terminated by either party hereto, by giving written notice to the other party, but that upon the termination hereof, the equipment herein set forth shall be returned in first-class condition to the State at the office of its representative at (location of office) as soon as practicable thereafter.

"It is further mutually agreed that the Lessee shall save the State free and harmless from any liability or damages or costs of any nature whatsoever which may occur by reason of the Lessee using or having possession of such equipment during the period that this agreement is in effect.

"It is further understood that said equipment is to be used exclusively within the boundaries of the State of New Mexico, unless permission is given to the Lessee by the State Highway Engineer, in writing, granting the lessee the authority to remove and use such equipment outside the State of New Mexico.

"It is further mutually agreed that the State shall credit the Lessee with the costs which the Lessee shall pay to place such equipment in first-class condition at the time that the equipment is delivered into the possession of the Lessee, such credit to be applied upon the rental due from the Lessee to the State, it being understood that the State shall be furnished with a completely itemized statement of such costs and that the State may disallow any of such costs which it deems were not necessary to restore the equipment to first-class condition. Should the costs of repairs to the equipment at the time it is received by the Lessee exceed the rental for the period during which the Lessee has possession of the equipment, the Lessee shall be credited only for the total amount of the rental, and the State shall not be liable for the excess of such costs beyond and above such rental."

Scrap in the Scrap

As the casual observer will have noted in the past, practically all state highway district yards have been, in sections, virtual junk yards as obsolete or worn-out equipment was always put aside, just in case some of the parts might be used sometime. The New Mexico State Highway Department was no exception to this rule, but now it has cleaned out every bit of junk from its yards and shipped it to make "hot steel" for delivery to the Axis in dead earnest.

New Catalog on Line Of Vibratory Equipment

The complete line of Syntron products, including Vibra-Flow and other types of feeders, concrete vibrators, electric hammers, self-contained portable gasoline-hammer concrete breakers, and rock drills, is described and illustrated in the new Catalog No. 435 issued by Syntron Co., 227 Lexington Ave., Homer City, Penna. In addition, the catalog shows installations and applications of the various types of this equipment.

Copies of Syntron Catalog No. 435 may be secured by interested contractors and engineers direct from the manufacturer by mentioning this item.

Caterpillar To Increase Military-Tractor Production

Substantially increased production of Caterpillar diesel tractors for military purposes will be achieved in the near future, it has been announced by Louis B. Neumiller, President, Caterpillar Tractor Co. Some of the work will be done in the Victory Ordnance Plant at Decatur, Ill., operated by the Caterpillar subsidiary, the Caterpillar Military Engine Co., and much of the manufacturing and final assembly will be handled in the Berwick, Penna., plant of the American Car & Foundry Co.

Certain parts for the additional tractor production will be manufactured in the Peoria and San Leandro Caterpillar plants. To permit this increased production in the Peoria plant which is already working to capacity, this plant will be relieved of requirements to produce certain other items of war material now being manufactured there.

C. O. Wold, Vice President of Caterpillar, will be in charge of the entire program. Charles Woodley, Factory Manager of the tractor plant, has been detached from that service to become coordinator of the tractor-production activities at Decatur and Berwick. During Mr. Woodley's assignment to this task, Assistant Factory Manager William Naumann will be Acting Factory Manager.

Oil for Victory. Caterpillar diesel tractors with pipe layers handling 24-inch pipe for War Emergency Pipelines, Inc., in Pennsylvania.

Arc Welding Studies

"Studies in Arc Welding—Design, Manufacture and Construction", recently published by the James F. Lincoln Arc Welding Foundation, contains 98 outstanding papers on arc welding by trained technicians and engineers which were submitted in the Foundation's 1940-42 Industrial Progress Award Program. This volume of 1,295 pages is the result of the editing of papers on arc welding practice representing the work of 113 engineers, designers, works managers, superintendents, executives, foremen and other technicians, each of whom applied himself individually to a specific design study involving arc welding.

The purpose of the volume is to provide engineering, technical and trade schools as well as engineers and contractors using welding extensively with the vast amount of arc welding design applications, together with welding data which may be translated into new applications, resulting from the Industrial Progress Award Program. There are 1,007 illustrations, most of them actual photographs of welding procedures. The contents of the book are arranged in nine sections with 98 chapters, each section covering a specific field and each chapter dealing with a specific design subject.

Copies of "Studies in Arc Welding", which is bound in semi-flexible simulated leather, 6 x 9 inches in size, may be secured from the James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland, Ohio. Price: $1.50 a copy, postpaid in the United States; $2.00 a copy elsewhere.

Northwest Representative For H. K. Porter Co., Inc.

H. K. Porter Co., Inc., Pittsburgh, Pa., has announced the appointment of F. B. Schwartz, Manager of Minnesota Pneumatic & Electrical Tool Co., Minneapolis, Minn., as its special representative in the Northwest for the complete line of Porter products, comprising industrial locomotives, chemical processing equipment, and all types of pumps. From 1926 to 1935 Mr. Schwartz worked for Chicago Pneumatic Tool Co., becoming Chicago Assistant Manager, and since then has operated the Minnesota Pneumatic & Electric Tool Co., at 2231 Riverside Avenue, Minneapolis, Minn.

Hercules Powder Starts New Sales Research Div.

The establishment of a Sales Research Division to investigate new markets for Hercules chemical products and to study the needs of industries served by the chemical company has been announced by Hercules Powder Co., Wilmington, Dela. Dr. John H. Long, who has been with the Hercules organization for the past ten years, specializing on various technical problems, will be in charge.

Wickwire Spencer Elects Holder New President

E. Perry Holder, former President of the Vulcan Iron Works, Wilkes-Barre, Pa., has been elected President of the Wickwire Spencer Steel Co., succeeding E. C. Bowers, President of the company since 1926, who has resigned from that position because of ill health. Mr. Bowers will, however, continue as a member of the Board of Directors and Executive Committee and act in an advisory capacity. Carl I. Collins will continue as Executive Vice President in charge of production.

Practically all of Mr. Holder's business career has been in executive positions connected with the manufacture and sale of steel and other metal products. He was Executive Vice President of American Machine & Metals, Inc., New York City, until 1937 and since 1940 has been President of Vulcan Iron Works, in complete charge of all operations, which position he resigned to join Wickwire Spencer.

Proper Equipment Care Speeds Minn. Road Job

(*Continued from page* 21)

maintenance. Proper operation of road-building equipment is part of the battle, and lubrication is another. All equipment on this reconstruction job was checked, greased and serviced during the half-hour between shifts.

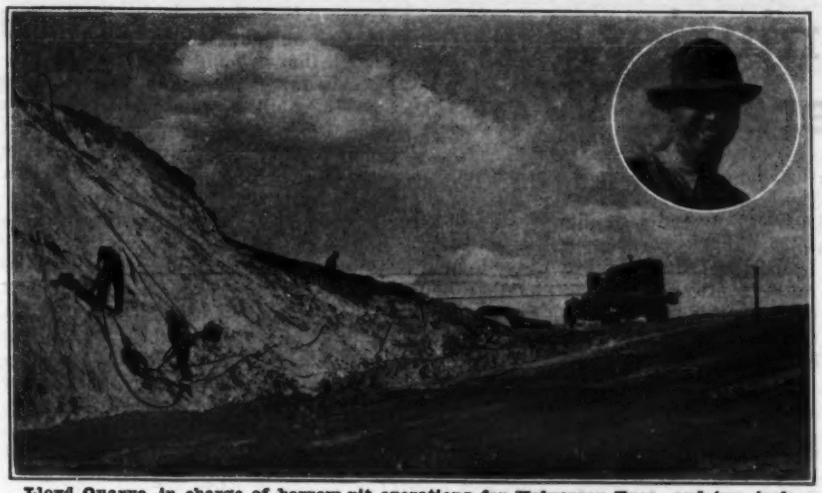
With seven cable-controlled scrapers forming the dirt-moving outfit on the job, Mackey found it expedient to see that cable breaks did not slow down operations. On Morse Brothers' jobs, maintenance of wire rope starts when a spool arrives on the job. Care is exercised in reeving the rope and starting it over the sheaves. Turns must be started correctly so the rope lies flat and the strands do not cross each other. The sheaves must be in perfect alignment to prevent the rope from riding the sides of flanges which causes serious abrasion. Groove and flange surfaces of the sheaves should be smooth at all times and the rope should sit freely in the bottom of the groove.

It is important in operations where the wire rope is not only subjected to continuous wear, but is operated over small sheaves, as in the case of scrapers, that a flexible rope be used. Because it wears longer and is more flexible, preformed wire rope is used by Morse Brothers on all scrapers. They have found that a preformed-type wire rope will stand up much longer under difficult working conditions than the ordinary type. Even after many weeks of strenuous work, preformed cables on the scraper units did not show signs of fatigue.

Maintenance of the wire rope on the scrapers used by Morse Brothers does not end with the selection of the best-type wire rope and correct winding. Although wire rope is lubricated in manufacture, the original lubrication must be renewed regularly. They use a good grade of lubricant which is applied to the scraper cables every 24 hours with a fairly stiff paint brush. Although some contractors use discarded crankcase oil as a rope lubricant, Morse Brothers do not advocate this method of lubrication. They believe that minute particles of carbon and grit in the crankcase oil act as an abrasive on the rope and may cause serious harm. A check on the life of the preformed wire rope used on the scraper cables on this project showed good performance with few breakdowns. The working life of the preformed wire rope was about double that which might have been expected from ordinary cable under similar conditions.

Subcontract for Sand

Running concurrently with the grading operations was a subcontract awarded to Halvorson Brothers of Rochester for the production of 55,000 cubic yards of sand for stabilization. The borrow pit was located on a hill about one-half mile from the highway and near the middle of the project. A very fine white sand, so firmly compacted in the pit that jackhammers, powered by a Gardner-Denver air compressor, were used to break up surface sections, was loaded out to trucks at the pit by two ¾-yard Speeder shovels. The two shovels and a fleet of 13 trucks, consisting of Internationals and Ford V8's with St. Paul hoists and bodies, yielded an hourly average production of 250 cubic yards of sand at the pit.



Lloyd Quarve, in charge of borrow-pit operations for Halvorsen Bros., and two jackhammers breaking down the sand formation in the pit.

Once the sand had been broken up by the jackhammers, it loaded easily and presented no additional difficulties except that, being of such a fine quality, it threatened to act as an abrasive on the shovel cables. The contractor overcame this by using preformed wire rope, which resists abrasive action to a greater degree than ordinary rope, and by cleaning and lubricating the cables regularly.

Other Work

Two other contracts for work along Highway 44 at Mabel were completed prior to the start of operations on the Morse project. F. R. Williams of Owatonna installed eight concrete box culverts, winning the contract on a bid of $11,278. Schmidt & Dyrstad of St. James erected a 60-foot concrete deck and girder bridge over Riceford Creek at Mabel at a contract cost of $12,459.

Oswald Lind was Project Engineer for the Minnesota State Highway Department on all of the work.

Preventing Injuries To Welders at Work

Combatting Carelessness With Safety Habits Is The Best Insurance for Acetylene Welders and Cutters

✦ WARTIME production has increased the number of accidents to oxy-acetylene welding and cutting operators. Careful study of the causes of this increase revealed that a large percentage of the injuries did not "just happen", but were the result of carelessness or negligence and were therefore preventable.

Oxy-acetylene welding and cutting are not hazardous occupations, but a welding or cutting operator, like any other mechanic, may become injured if he permits himself to grow careless. The following suggestions from *Oxy-Acetylene Tips* are presented as an aid to all operators in assuring their own personal safety and that of their fellow workers.

Wearing Apparel

One of the most frequent forms of carelessness is improper wearing apparel. Most operators take great pride in their welding and cutting equipment and are careful to keep it in top-notch working order, yet many of these same operators will without a thought heedlessly expose themselves to the danger of severe flesh burns by failure to provide themselves with proper work clothes or to adjust them properly. Work clothes should be free of oil or grease and also of frayed edges and torn patches where sparks can lodge and start burning.

Woolen clothing is preferable to cotton because it does not ignite so readily. Likewise, fabric with a hard smooth finish is preferable to one with a nap. Woolens also protect the skin from the almost unavoidable sudden changes in temperature that an operator must experience.

Trouser Cuffs

Before starting a welding or cutting job, the operator should always roll down the sleeves of his shirt and the cuffs of his trousers. The latter is particularly important when cutting is to be done. If this precaution is not taken, flying sparks or hot slag are quite likely to lodge in them, and before the operator is aware of it, his clothing will be on fire and a painful burn may result. For the same reason, the flap on the breast pocket of the shirt should be buttoned or, better yet, the pocket should be removed entirely.

Shoes and Gloves

Hot metal or slag may also lodge inside of low shoes. Adjust the suspenders or belt, therefore, so that the trouser legs almost touch the ground at the heels. This will help keep the slag out. High shoes are much to be preferred to oxfords, if they are available. Those of the congress gaiter style are the most practical, since they have no laces or tongues to catch the sparks. Iron molders nearly always wear congress gaiters, as they have learned from experience that these provide the best protection to the feet.

Every operator should provide himself with a good pair of asbestos, leather, or fireproof fabric gloves of the long gauntlet type. The gauntlets not only ward off the sparks but also protect the hands and lower forearms from the heat.

Goggles

At all times while welding or cutting, or observing such work, the eyes should be protected by a pair of good well-fitting goggles designed especially for use with the oxy-acetylene process. Goggles serve the two important purposes of eliminating glare and as a protection against flying sparks.

The light from the inner cone of the oxy-acetylene flame is in itself quite intense, but the molten metal in the section that is being welded or cut produces a far greater glare. Eyestrain is sure to result if welding or cutting is done for any length of time without goggles. In welding, the eyes may be very close to the work for hours at a time so that the strain is much greater than in most other operations where molten metal is involved.

Aside from the question of glare, the eyes are so close to the work that it is most advisable to protect them against flying sparks or particles of molten metal that may be spattered about. Goggles also protect the eyes from reflected heat, which dries the surface of the eyes, causing irritation.

Correct goggle lenses are made of special-colored optical glass that minimizes the effect of glare and at the same time permits the operator to see his work clearly. Lenses are available in light, medium, and dark shades. In general, the light shade is for cutting operations, the medium shade for average run-of-shop welding operations, and the dark shade for heavy welding where a large puddle of molten metal is present, such as in the fusion welding of a large gray iron casting.

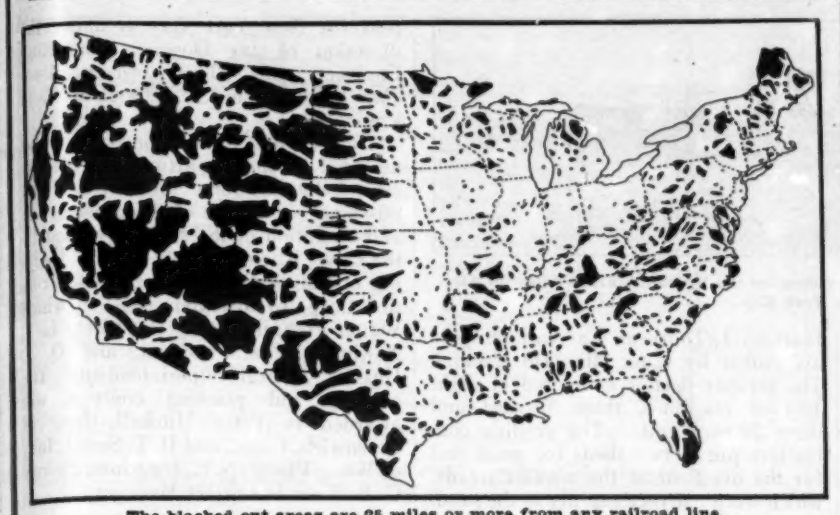
Goggle frames should, of course, be light-weight and well-ventilated, and should fit the contour of the face for the sake of comfort. Fiber, hard rubber, and plastic are ideal goggle-frame materials since they do not break easily when dropped and do not absorb heat. Frames made of metal soon become hot and burn the operator's face.

Added Safeguards

A piece of sheet metal leaned against the worktable will to a large extent reduce the possibility of burns to the feet and ankles.

A pail of water placed directly beneath a cut to catch the oxides and sparks is another efficient method of preventing burns. It will also prevent the sparks from scattering about the floor, where they may lodge in an ob-

(*Concluded on page 64*)



The blacked-out areas are 25 miles or more from any railroad line.

Why Roads, Vehicles And Tires Are Vital

A recent survey shows that 54,000 communities in the United States are entirely dependent upon highway transportation for all movements of persons and freight. It is therefore absolutely necessary to keep highway transportation functioning in this country to move the entire output of food and other agricultural commodities, metals, and products of forests and stream from these areas which would suffer virtual transportation paralysis if the necessary highway services were not maintained.

In a folder recently issued by the National Highway Users Conference, it is pointed out that it is equally important to maintain motor vehicles and highways serving as assembly lines between war production plants and in the movement of supplies to Army and Navy reservations and ports. Millions of employees of war plants and essential civilian workers rely solely on highway transportation to get to and from their work.

Some idea of the importance of these communities dependent upon highway transportation may be gained from the fact that in New Mexico they contain 30 per cent of the non-farm population of the state, in Maine 27 per cent of the non-farm population, and 24 per cent of the non-farm population in Vermont. There are 15 states in which 10 per cent or more of the population are living within communities dependent upon highway transportation, and 43 per cent of all communities in the United States depend on motor vehicles for all movements of passengers and freight.

Westinghouse Announces New Buying-Data System

New simplified buying data in bound and loose-leaf form for quicker selection, easier ordering, and speedier delivery have been announced by the Westinghouse Electric & Mfg. Co. Buyers of motor and control equipment may secure copies from the company's district offices only; no mailings will be made from the Westinghouse headquarters at East Pittsburgh.

Bound books contain prices, dimensions, application data, and descriptions. The 180-page "Motor Buying Data" covers popular types and ratings of motors up to 100 hp, gearmotors, and M-G sets. "Control Buying Data", 276 pages, lists a wide variety of controls and accessories for dc, single-phase, squirrel-cage and wound rotor motors.

Arranged to fit buyers' needs and eliminate selection errors, the new books include only pertinent buying data. Special features are the new index system for quick product selection, and the directory of standard equipment designed to eliminate the need for specially built motors and controls.

Bridge Design Competition Suspended Until End of War

The American Institute of Steel Construction announces that, due to the effect of conditions brought about by the war emergency, it has decided to suspend its Students' Annual Bridge Design Competition until after the war has ended.

This action, although necessary because of students' wartime schedules, is greatly regretted by the Institute, particularly on account of the gratifying response on the part of students since the competition was inaugurated in 1929. The interest shown by the student entrants in this competition led to a marked stimulation of ideas in connection with modern bridge design.

Facings and Linings For Clutches and Brakes

Velvetouch all-metal friction material for clutch facings and brake linings is described and its uses illustrated in a new folder recently issued by the S. K. Wellman Co., East 51st St. at St. Clair, Cleveland, Ohio. The bulletin points out that rugged and long-wearing characteristics of Velvetouch make it particularly adaptable for the clutches and brakes on construction equipment which is subjected to hard wear and rough usage.

Copies of this folder and additional information on the use of Velvetouch for clutch facings and brake linings may be secured by interested contractors and engineers direct from the manufacturer. Just mention this item.

Placing and Grading Sand Fill for Airport

(*Continued from page 29*)

accidents from slack cable. Lockers and store rooms take up most of the space below deck. One rack is devoted to a stock of conduit and regular pipe, steel rod and tool steel.

Below on the port side are bins for clamps, bolts, nuts, etc., and more lockers. The fuel oil for the American Radiator Co. oil furnace is stored in a tank here, guarded by a fire extinguisher.

Auxiliaries

A standard A-frame derrick on a 20 x 35-foot wooden barge with a gas-engine-driven 2-drum 5-ton hoist is used for placing the anchors. A steam derrick barge with a 54-foot boom and an 8-ton 2-drum Lidgerwood hoist is used for every conceivable type of work.

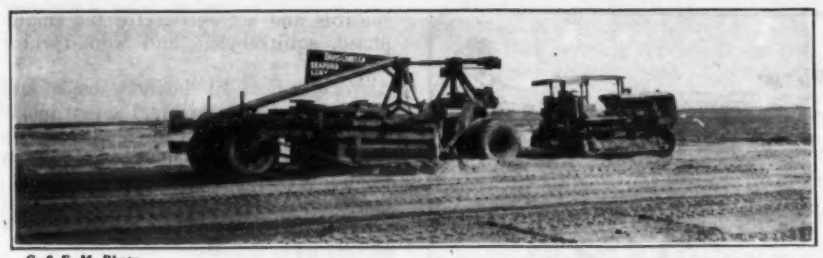
Three P&H-Hansen electric welders used for the regular repairs of the pump throat and impellers are run off the high-tension line or the auxiliary diesel generator. When the current is off, welding is done with a Lincoln auxiliary welder.

On the Discharge Line

Maintenance of the 30-inch discharge line, the valves, and the constant moving of the pipe keeps 12 to 14 men busy on the 25-foot lengths of pipe used with the Nebraska and a crew of 10 to 12 men on the 16-foot lengths of pipe on No. 5. Two RD7 tractors are used to move the pipe and valves. The use of hand-operated valves on the alternate lines has been abandoned because of so many breakages of the main valve stems. Hydraulic operation of the valves has been found much more satisfactory. When a big shift is to be made in the pipe line, the day shift is held over or the night shift called up early so that there is the maximum number of men to speed up the change.

Moving the Sand

All of the fill comes from the seaplane landing areas and the seaplane basin. At the landing areas the dredging is carried from mean low water, which is the elevation of the top of the ground, down to 30 feet below MLW. In the basin, dredging is being carried to —15 only from 0.0 feet.



C. & E. M. Photo

A LeTourneau Carryall and D8 start final grading on the hydraulic fill at Idlewild Airport in New York City.

The two dredges have been placing 60,000 cubic yards in the fill per 24-hour day, with an average line of 5,000 feet. The Nebraska moves about 1,800 cubic yards an hour and No. 5 about 1,200 yards an hour under these conditions. The maximum line pumped by the Nebraska on this job was 12,000 feet. The Nebraska pumps about 16 per cent solids on an average.

Grading

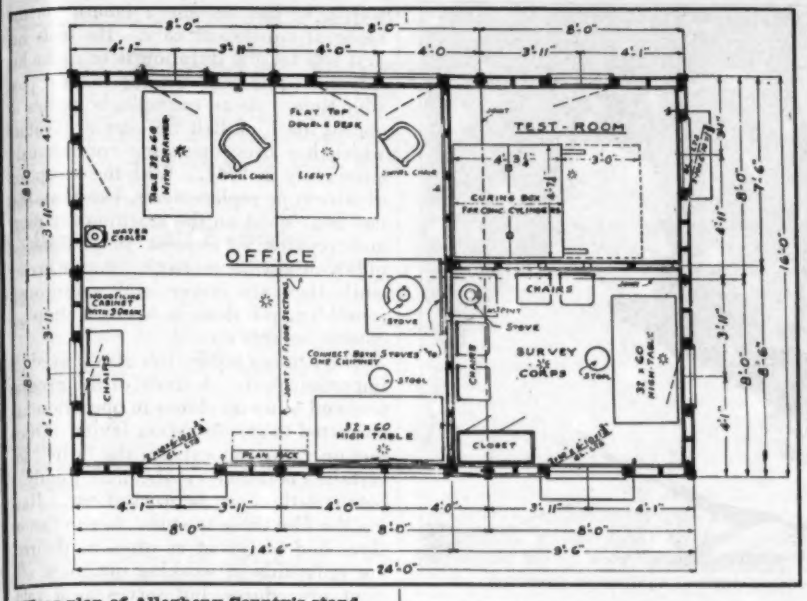
The grading operation started just after the middle of June, 1943, with fourteen LeTourneau Carryall scrapers all pulled by Caterpillar D8 tractors. The scraper fleet is composed of eight 12-yard machines, three 16-yard and three 20-yard units. The grading contractors put in two sheds for parts and for the overhaul of the crawler treads, which wore out very rapidly in the sand. A grease truck with hand guns for lubrication was operated throughout the work.

Personnel

The construction of the Idlewild Airport for New York City is under the direction of Jay Downer, Consulting Engineer, with Wharton Green, Associate Engineer, and E. J. Carrillo, Field Engineer.

The contracts for the construction are awarded by the Department of Marine and Aviation, John McKenzie, Commissioner, in charge of the construction and operation of the airports owned by the City. The contractor for the dredging operation is the Gahagan Construction Corp., of Brooklyn, N.Y., of which Walter H. Gahagan is President, L. J. Newburg, Vice President, and O. J. Hussin, General Superintendent. The grading and planting contract was awarded to Peter Mitchell, Inc., of Greenwich, Conn., and D. T. Small, Inc., of White Plains, N.Y., for whom Sydney G. Berliner is Project Manager.

Repairs to roads in Manchester, England, after the war will cost approximately £1,330,000, according to estimates prepared by the Manchester Municipal Highway Department.



Floor plan of Allegheny County's standard engineer field office.

Demountable Office For Engineers, Tests

Allegheny County, Pa., Designed A Standard Wooden Building To Be Built by Contractor, Which May Be Taken Apart, Stored, Reused

(*Photo on page 68*)

FIELD Engineers, whether under the title of Resident, Project or Testing Engineer, set up their offices and laboratories in divers places. We have seen an old chicken coop serve as a Resident Engineer's office in New England, a defunct bank in West Virginia, and a luxurious affair with curtains and window boxes in Wisconsin (C. & E. M., June, 1942, page 53).

Allegheny County, Pa., reputed to be the wealthiest county in the United States, in its specifications for construction projects requires that a suitable separate building shall be provided by the contractor in an approved location, equipped for the exclusive use of the county as an office and for the proper storing of field equipment and conducting tests on materials. Also, telephone service for the exclusive use of the county must be maintained by the contractor in this building.

The building furnished by the contractor is erected according to detailed plans provided by the county, which call for a panel structure 16 x 24 feet which can readily be taken down and stored so that it may be used on other county work as desired. The building is entirely enclosed, of wood construction with lap siding, tight tongue-and-groove wood flooring, waterproof, lined with beaver board or equivalent, and provided with ample heat. The rooms are wired and artifical light is provided, with lamps and convenient outlets. The outside of the building is given two coats of paint.

No section of the building may have a greater width than 96 inches, and all sections are bolted together to permit taking down and re-erecting the building by unskilled laborers, using only wrenches as tools. The doors have pin butt hinges and adequate locks, and the windows are made so as to be easily removable.

The contractor is required to provide new furniture, consisting of a table 32 x 16 inches with a drawer, one double flat-top desk, two stools and eight arm chairs, including two swivel chairs, one wooden filing case with three drawers, and a water cooler. The contractor also furnishes the materials and is required to build two tables 32 x 60 inches, storage cupboards, plan rack, shelving, and other minor equipment and conveniences.

The flooring underneath the storage boxes for the concrete test specimens in the Test Room must be provided with adequate support on wooden sleepers laid on the tongue-and-groove flooring and below to eliminate vibration.

Instead of building such a structure, the contractor is permitted to rent, for the exclusive use of the county as an office, space having equal floor area, facili-

(*Concluded on page 56*)

Hobby Proves Aid In Equipment Care

Contractor Camera Fan Finds Miniature Movies Show Up Defects And Help Train New Men

✦ FOR many years, J. A. Caesar of the Caesar Construction Co., Topeka, Kansas, has been a camera fan. Until recently, however, most of his movies were taken on vacations, in this country and in Mexico and Cuba. But since December, 1941, the movie hobby has been turned toward achieving speedier operation on his jobs, longer life for his equipment, and for training new equipment operators. A hobby with a double purpose is worth cultivating in times like these, and Mr. Caesar reports that he is getting as much fun out of picture taking as he ever did and, in addition, is learning a lot of things he never knew before about his own business.

Mr. Caesar has an 8-mm Bell & Howell turret-type camera with three sets of lenses, a 2.5 fixed, a 3.4 telephoto, and a 1.4 focusing. The cost of the camera with the three lenses was around $350. The projector, also a Bell & Howell, cost $125 and the screen $25, making the whole outfit total about $500. Mr. Caesar feels that he has saved this much money on one better method of operation developed from using this hobby in connection with his excavating business.

His machine operators often join Mr. Caesar in reviewing these films so that each operator may study the other operators' methods. Discussion and expression of opinion on operating methods have led to many improvements and new developments for speeding up the job.

Present Work

Recently Caesar's three Link-Belt Speeders completed a 42-mile drainage job for the Kansas Division of the Union Pacific Railroad, and are now working on a similar project, 75 miles in length, for the same railroad. Like all contractors these days, Mr. Caesar was faced with the problem of making his present equipment keep working at top efficiency, with a minimum of down time.

Equipment Care

One of the points which the film study has brought out is the value of repeated lubrication. To use Mr. Caesar's own words, he has become a fanatic on the value of equipment care. He feels his *first* job for the duration is to make his existing equipment last the longest possible time. As an example, he points to one of his Link-Belt Speeder excavators which has been operating continuously since early in 1941. With the exception of wire rope replacements, less than $50 has been spent on the machine for parts and repairs. Frequent inspections, a policy of always correcting minor errors while they are minor, and a thorough rebuilding job done in his own shop accounts for this record.

The camera hobby has also played an important part. A study of the excavators and other machines in operation has corrected many operation faults. Often one operator can explain the "why" for certain operation errors, and jointly a better method can be worked out. Having the film there to study, to run fast or slow, and to repeat as often as desired, not only aids in working out more efficient procedures, but serves as a valu-

(*Concluded on page* 65)

J. A. Caesar running through a film showing details of equipment operation.

Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

Contractor Is "Engaged In Interstate Commerce"

There is one badly neglected source of scrap rubber. It is to be found in the elasticity of laws, as interpreted by the courts. Take for example the decision rendered by the New York City Court, Queens County, in the case of Hewlett v. Del Balso Construction Corp., 40 N. Y. Supp. 2d, 224. There the "rubber" in the Federal Wage and Hour Law was stretched to the utmost.

It was decided that a highway contractor's watchman was entitled to the benefits of the law as having been engaged in interstate commerce. His job was to fill warning lamps and place them at barricades, and patrol an uncompleted highway on Long Island to see that the lamps remained lighted. It did not appear whether the highway itself would carry interstate travel or not, but it did appear that cars bearing license plates of states other than New York used intersecting arterial highways.

Although the decision was rendered by a minor court, and may be reversed by any one of several outranking tribunals, it is noteworthy because it cites several decisions of higher courts in line with the conclusions reached. Considerable stress was placed upon a ruling of the Wage and Hour Administrator that "Employees of contractors engaged in maintaining, repairing or reconstructing railroads, * * * highways, bridges, pipe lines, navigable waters * * * or other essential instrumentalities of interstate or foreign commerce would seem to be engaged in interstate commerce and subject to the act."

Measuring the Damages For Breach of Contract

There is an important rule of law that works both ways in matters which vitally affect every contractor. It works in his favor when he seeks damages for being prevented from performing a profitable contract; it works against him when he inexcusably refuses to receive materials for which he has bargained.

The rule is that one aggrieved by refusal of another to permit performance of a contract involving the use of labor, materials, etc., is entitled to recover, as damages, the contract price, less what it would cost to perform the contract.

In the recent case of Purvis & Bertram v. Shaw, 164 S. W. 2d, 416, decided by the Texas Court of Civil Appeals in Fort Worth, a sand and gravel contractor sued bridge contractors for refusing to receive material they had contracted to buy for use in constructing bridges. The court rejected the contention made by the bridge contractors' attorneys, that the case was governed by the rule applicable to breach of contracts to buy staple commodities commonly carried in stock by dealers. Under that rule the gravel contractor would have been required to choose one of the following courses: (1) Hold the sand and gravel for the bridge contractors' account and sue them for the price. (2) Keep the gravel as his own and sue for the difference between the contract price and the market value of the material, which, of course, might be negligible. (3) Sell the material for what might be secured from a third party and sue the bridge contractors for any loss over the contract price. (This latter course would be equivalent to saying that if an owner refuses to permit a contractor to perform a contract job, the contractor would have to try to get another job to take its place and would not be entitled to recover any damages if he should make as much out of the new job as he would have out of that covered by the broken contract.)

The high spots of the court's decision are as follows:

"When one is prevented from performing a contract by a breach by the other, the measure of damages is the amount of profit the former would have made if permitted to perform; this is arrived at by deducting the cost of performance from the contract price. * * *

"Plaintiff is shown to have been in this business for many years and that his materials were procured as above indicated and processed by employees by means of the machinery and equipment furnished by plaintiff. We may fairly assume that plaintiff was in a position at all times to carry out the terms of his asserted contract and at the same time make and perform other contracts of a similar nature during the time this one was being executed. Certainly the fact that he had other contracts in process of performance would not relieve defendants of damages resulting from their breach of their contract with plaintiff."

It is to be carefuly noted that the opinion in this case has no application to contracts by *dealers* in materials stocked but not manufactured by them. It applies only to cases where the seller contracts to furnish materials produced by him.

Rights of Lowest Bidder

The commonly reserved right of public boards to "reject any and all bids," in inviting proposals to do public work, gives broad discretionary power to a board. It does not permit arbitrary discrimination against one who is manifestly the lowest responsible bidder for the job, by awarding it to a higher bidder. But where there is reasonable ground for the exercise of an honest discretion, the courts will not interfere with the official conclusion reached.

In an interesting Oklahoma lawsuit, it appeared that Oklahoma City thrice invited bids on a water supply project, and that each time the plaintiffs presented the only bid. Each time the bid was rejected under reserved right, and the third time the city resolved to do the work itself on force account. Plaintiffs sued to compel acceptance of their bid. Refusing to interfere with the action of the municipal board, the Oklahoma Supreme Court said (S. J. Groves & Sons Co. v. Oklahoma City, 129 Pac. 2d, 185):

"There are no facts stated in the petition showing that the defendants abused their discretion, or acted arbitrarily or capriciously, or in bad faith nor do the facts warrant such inference. It is much more reasonable to infer that the defendants, after trying three times to get other or lower bids on the work, decided it could be done less expensively on force account. Whether this decision be wise or otherwise, mandamus will not lie to compel a different conclusion."

Subcontractor Liable For Own Negligence

An employee of a grading crew on a highway was injured through careless driving of a truck that was hauling gravel onto the job from a pit. The gravel company's only connection with the job consisted in furnishing gravel to the grading contractor. The question arose as to whether that company was liable for the accident, in view of the fact that the careless driver was the employee of a haulage contractor employed by the gravel contractor to deliver the gravel on the job. The Iowa Supreme Court decided that the gravel contractor was not liable because the haulage contractor was an independent contractor and as such was liable for the careless driving of his own employee. (Lind v. Eddy, 6 N. W. 2d, 427.)

The facts on which the decision was based were these. The gravel company paid the haulage contractor so much per ton for hauling the gravel, and merely designated where the material was to be delivered. All the details as to loading, unloading, and movement of the trucks were under the control of the haulage contractor.

Forms and Concreting For Underpass in Ohio

(*Continued from page 7*)

end and then the forms from Stage 1 used for Stage 3. In the building of a single section of the forms for the deck in the first stage, a few 8 x 8-inch posts were placed at the face of the abutment walls and at the pier, and were capped with an 8 x 8-inch timber beneath the forms. A short bent was erected halfway between the pier and abutment wall and three lines of 8-inch 17-pound wide-flange I-beams were placed to form an erection platform for the deck forms. These consisted of a backing of double 2 x 6-inch stringers at intervals of 2 feet and the longitudinal floor form of ¾-inch sheeting. The 33½-inch wide-flange I-beams, weighing 152 pounds per foot, were then placed on 12-inch grillage beams imbedded in the abutment and pier. Dayton tie rods, in inverted U shape, were then laid over the beams and run through the floor, being locked below the double 2 x 6-inch cross stringers, thus hanging the deck forms to the structural beams which were fully encased in the concrete deck. These ties were placed on alternate beams at 2-foot intervals longitudinally. Repeat forms were made, using the same panel forms for each pour on walls and pier. The same forms and erection materials were used repeatedly in the several sections of the deck.

Concreting

The east-abutment footing was poured first and then the abutment wall poured up to the top elevation, followed by the pier and last the west abutment in each stage successively. Batches for the concrete were furnished by Marble Cliff quarries, Port Columbus Plant, and were mixed and delivered in Jaeger truck mixers by W. E. Anderson & Son of Columbus, Ohio. For the footings the concrete was chuted from ground level direct to the forms. The balance was lifted by the Northwest crane and a bottom-dump bucket and all concrete was vibrated in place by a White gas-engine-driven vibrator. As a considerable portion of the concrete was poured in cold weather, it was delivered from the plant heated and then cured with steam from the Erie steam crane. Sisalkraft paper on a frame was built up on the north side to protect the concrete and the top was covered with tarpaulins. On the inside where the sheet piling surrounded the concrete on three sides, tarpaulins were used only at the top.

The maximum pour for a footing was 122 yards which was completed in 6 hours. On the deck the maximum pour was 124 yards. It was possible to deliver only 20 yards per hour when pouring direct from the trucks because of the restricted character of the site, and only 10 yards per hour when the concrete had to be placed by crane and bucket swinging over the tracks. Frequent interruptions for the passage of trains was also a great delaying influence.

Quantities and Personnel

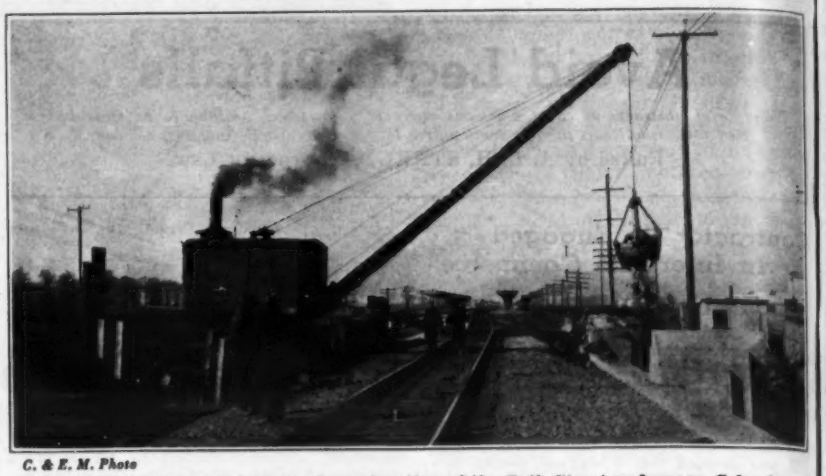
The major quantities involved in the railroad structure, exclusive of steel sheet piling, were:

Excavation, structure, unclassified	1,950 cu. yds.
Concrete footings	633 cu. yds.
Concrete walls	1,074 cu. yds.
Concrete deck	635 cu. yds.
Waterproofing	450 sq. yds.
Plastic cement expansion joint	227 lin. ft.
Membrane waterproofing with 3-inch concrete protection and wire fabric	560 sq. yds.
Membrane waterproofing	39 sq. yds.
Reinforcing steel	38,273 lbs.
Structural steel, including grillages	422,500 lbs.
Bituminous-coated flashing	414 ft.
Expansion joints	92 ft.
Premoulded bituminous expansion-joint filler, ½-inch	1,489 sq. ft.
Premoulded bituminous expansion-joint filler, 1-inch	280 sq. ft.
Premoulded bituminous expansion-joint filler, 2-inch	240 sq. ft.
Plain cement-asbestos pipe, 8-inch	61 ft.
Perforated cement-asbestos pipe, 8-inch	314 ft.
Porous backfill	130 cu. yds.
Construction joints	114 ft.
Railroad excavation for detour roadbed	770 cu. yds.

The major items under the roadway contract were as follows:

Roadway excavation	74,297 cu. yds.
Pipe storm sewer under pavement, plain and reinforced, 8 to 24-inch	2,328 ft.
Plain concrete roadway-drainage pipe, 8 to 15-inch	4,900 ft.
Asphaltic concrete, base course	2,878 cu. yds.
Asphaltic concrete, leveling course	2,404 cu. yds.
Spreading, shaping and compacting	2,510 sq. yds.
Asphaltic-concrete, surface course, 2½-inch	34,793 sq. yds.
Insulation course, 1¼ inch	34,550 sq. yds.

The contract for the Poth Road underpass was awarded by the Ohio Department of Highways, H. G. Sours, Director, for $318,310, to R. J. Dienst Co., Columbus, Ohio, for whom Harold Buell was Superintendent. The subcontract for the structure was given to Baker & Hickey Co., of Columbus, Ohio, for $119,164. E. A. Corwin was Superintendent for the subcontractor while John F. Hickey of the company maintained constant contact with the work. Ralph Wood was Project Engineer.



C. & E. M. Photo

Excavation in the second stage of construction of the Poth Street underpass, Columbus, using a steam crane and clamshell.

29th Purdue Road School Proceedings Now Available

The *Proceedings* of the Twenty-Ninth Annual Road School held at Purdue University, Lafayette, Ind., January 25-27, 1943, has been published as Extension Series No. 55 by the Engineering Extension Department. This volume, compiled and edited by Ben H. Petty, Professor of Highway Engineering, contains the papers and discussions presented at the Road School, which cover various wartime highway problems, highway and airport drainage design, the uses of aerial photographs and engineering soil maps, and other subjects of interest to state and county highway engineers. At the back of the book is a complete list of the publications of the Engineering Extension Department.

Copies of this *Proceedings* may be secured without charge by those interested direct from the Engineering Extension Department, Purdue University, Lafayette, Ind.

New Oil-Purifier Bulletin

A new illustrated folder describing the Youngstown-Miller A and GH lines of lubricating and hydraulic oil reclaimers is now ready for distribution. This new bulletin covers YM oil reclaimers with capacities ranging from 2½ gallons in 70 to 90 minutes to 120 gallons in the same length of time.

These reclaimers are designed for restoring all types of used oils, including those drained from diesel engines, hydraulic machines, gear reducers, compressors, gasoline engines, pumps, and similar installations. There are eleven different models in the two series, both types using contact filtration in which common refinery earths available in the open market are utilized. The machines have a two-stage filter press, are semi-automatic, operating under thermostatic control, thus permitting the man operating the machine to do so incident to his regular work.

Copies of this bulletin, YM-600, may be secured by interested contractors and state and county highway engineers direct from the Youngstown-Miller Co., Sandusky, Ohio. Just mention this item.

Atlas Promotes Davis

W. C. Davis has been appointed Assistant Director of Sales in charge of the Export and Contractors' Sections of the Explosives Department of the Atlas Powder Co., Wilmington, Dela. Mr. Davis, who completed 25 years with Atlas last year, has been Manager of the Contractors' Section since 1937.

County Builds New Timber Arch Bridge

(*Continued from page* 25)

originally intended to place the two halves of each truss simultaneously by motor cranes, but since only one crane was available it was necessary to devise a method of holding one-half in position while the other was being placed.

This was done in the following manner. Deadmen were set in line with the trusses behind the abutment at one end of the bridge. The two half trusses at that end were placed and guy ropes attached to prevent lateral movement. Cables were then fastened near the crown of the truss and run back to the anchorage where they were attached through a chain block on each. The crown end of the truss could thus be adjusted vertically. The crane was then moved to the other end, the other two halves placed and the pins driven. In this manner the trusses were set without any difficulty.

Each half truss weighed about 7 tons and could not be handled by the boom of the motor crane from the abutment. To overcome this, the end bents were erected first and a false bent set on the arch abutment. Stringers were then placed over the trestle spans which, when planked, enabled the truck crane to move out to a position over the arch abutment from where the trusses were easily placed.

Hand-Rail and Treatment

The hand-rail is a modification of the composite type, being entirely of wood. The cap is 4 x 12 with the top beveled to each side of the center. The two lower rails are 4 x 8 and the balusters 4 x 9⅛ inches, held in place at the top by two 2 x 3 strips bolted to the cap and at the bottom by a bolt through each baluster and the two bottom rails. The posts are heavy, for appearance, being 13½ x 13½ inches. The caps are attached to the posts with ⅜ x 6 x 4-inch angles, the lower rails by ⅜ x 6-inch brackets.

All the timber was pressure-treated by the Chemonite process. This treatment gives the timber a mottled green color which blends very well with the landscape.

Quantities and Personnel

The materials used in the construction of this timber bridge were:

Lumber (treated)	64,820 ft. BM
Hardware	7,100 lbs.
Concrete	172 cu. yds.
Asphaltic-concrete pavement	853 sq. yds.

The lumber was furnished and treated by the West Oregon Lumber Co. and was framed and erected by Timber Structures, Inc., both of Portland, Ore. George W. Buck, County Roadmaster, is in charge of all Multnomah County road and bridge construction.

New Mack Officers

Announcement has been made of the election of C. T. Ruhf as President of Mack Trucks, Inc., Long Island City, N. Y., succeeding the late E. C. Fink, former President and Chairman of the Board. Mr. Ruhf, who has been associated with the company since 1912, has been Executive Vice President since last January, and prior to that time had been Operating Vice President in charge of factories. In the latter capacity he supervised the building of the heavy-duty motor trucks and prime movers which Mack is now supplying to the armed forces and also the huge Mack-built transmissions used in many of the Army's 30-ton tanks.

A. N. Morton has been appointed Vice President of Mack Mfg. Corp. and C. W. Haseltine has been made Vice President of Mack Trucks, Inc. Mr. Morton joined the Mack organization at the end of World War I and has held a variety of positions, the most recent being Production Manager for the Plainfield and New Brunswick, N. J., and Allentown, Penna., plants. Mr. Haseltine joined Mack in 1912, and since 1918 has been Secretary-Treasurer, in which position he will continue.

Brake Lining and Frictions For Construction Equipment

Complete information on Raybestos brake lining and other friction material for construction equipment is available from the Raybestos Division, Raybestos-Manhattan, Inc., Bridgeport, Conn. Also available are specification sheets, on which are listed the various friction-material requirements, with columns to fill in the sizes and other pertinent information, for convenience in ordering friction materials. These may be secured from your Raybestos distributor or direct from the company.

A Hough air-borne tractor shovel being unloaded from a glider.

Air-Borne Shovels On the Fighting Front

Flying construction equipment would have sounded fantastic a few years ago, but the efficiency and contribution to victory being made by air-borne construction machinery on every fighting front have proved the idea a sound and feasible one. Among the units designed and manufactured for our air-borne troops is the Hough air-borne tractor shovel, especially produced for transportation by plane or glider, and used for road and airfield construction, building gun emplacements, tank traps, and camp sites. Actually, this type of construction equipment is the machine in front of the man behind the gun. Another wartime application of Hough equipment is the use of tractor-powered brooms of various sizes for maintaining airfields and landing strips in the battle areas.

Although this equipment has been specially designed for wartime use, its compactness and rugged construction will prove equally serviceable on many types of peacetime construction in the days ahead.

Because of increasing government orders for this type of equipment, the Frank G. Hough Co. has found it necessary to triple the size of the buildings and production facilities of its No. 1 plant at Libertyville, Ill., it was recently announced.

New Blasting Method For Pipe-Line Jobs

The most difficult obstacles in laying pipe lines are usually at river crossings where submarine blasting is frequently necessary. A discussion of this problem in a recent issue of *The Explosives Engineer* describes a new method of blasting for pipe-line river crossings which speeds up this type of work.

There are two systems used in blasting a ditch for a pipe in the bottom of a river. Where the water is wide and deep, holes are drilled in the rock from a dredge boat along the line of the ditch, these are loaded through a pipe and fired electrically, and the ditch is then cleaned out by dredging equipment. In shallower narrower streams, the ditch can often be blasted without drilling, at a considerable saving in time and cost, by tying bundles of gelatin dynamite cartridges close together along a rope which is weighted and submerged to the river bed. To prevent the current from bowing the line, it is guyed at frequent intervals to a wire cable stretched taut above the surface along the line of the ditch. One bundle at each end of the line is primed with an electric blasting cap, and the wires are connected in series for simultaneous detonation. Sand bags are used to hold the charges in place and these, with the weight of the water, provide sufficient resistance so that the explosion is exerted downward to fracture the rock. This procedure has been widely used, but has certain disadvantages. The man-hours required to wrap the bundles and fasten them to the rope is a handicap, particularly in these days of man-power shortages. Then there is the danger that the cartridges will work loose from an insecurely wrapped bundle and cause a hazard by washing ashore downstream.

An improvement on this method of blasting for river crossings has been developed by the Hercules Powder Co. which greatly shortens the time of preparing the load and eliminates the hazard of floating cartridges by using Vibrogel in Spiralok cartridges. Spiralok was originally designed to facilitate the work of geophysical crews engaged in seismic exploration for oil and consists of heavy cardboard tubes threaded on the inside, with cartridges threaded to screw into the tubes. A cartridge is screwed into one end of the tube for half its length; another is inserted in the other end until the two cartridges meet. This leaves half of each cartridge protruding from the ends of the tube on which other tubes are screwed, and more cartridges and tubes added until the charge attains the required length. It is then tied to a rope and submerged.

The article describing the use of Spiralok states that this method is much quicker to prepare, there is no likelihood that cartridges will become detached and float away, and it is easier to place this more rigid continuous charge of explosives in a straight line along the river bottom and to hold it in place with sand bags.

Further details on Spiralok may be secured by interested contractors and engineers direct from the Hercules Powder Co., Wilmington, Dela., by mentioning this text.

Our fighting forces need our support as never before. The big offensive is only beginning. Get behind the boys in the "big push" with the regular purchase of War Bonds.

C. & E. M. Photo
A look into the drum of the Wood traveling mixer, showing the curved metal strip bolted to the feeder spiral to make up for wear, on the U. S. 30 job of the Wyoming Construction Co., west of Cheyenne.

Reprocessing Old Top On Road-Widening Job

(*Continued from page* 11)

gallon, one 5,000-gallon and one 2,500-gallon trailer tank trucks. This contractor lost the 5,000-gallon truck in a wreck, which somewhat slowed up the scheduled progress on the job.

Because the windrow of 8.4 square feet cross section was too heavy for the Wood mixer to handle in one operation, it was split by the power graders into two windrows at one side of the road and the mixer went up one and back the other windrow. The slow operation of the pugmixing section of the machine was not sufficient to break up such lumps of the old oil mat as were left in the windrow with the chip seal adhering to it, so these were removed by hand by two men working both ahead of and behind the machine.

The Wood traveling mixer was towed by a Caterpillar D8 tractor at 22 feet per minute for the 4.2-square foot windrow, pulling a 2,300-gallon asphalt tank equipped with a transfer pump for handling the asphalt from the hauling trucks to it. At the rear of the Wood mixer was a metering pump for delivering the asphalt at the predetermined rate to the pugmill mixer. The Wood machine has two complete spirals at the front to pick up the windrow and push it back through the pugmill section. The whole mixing section is driven by a heavy shaft from the power take-off of the tractor.

After mixing, this section of the job was reworked by a pair of blades for some time to complete the mixing and aerating, and then spread in thin layers and rolled by pneumatic-tire rollers until the full 2 inches of the mat had been spread and compacted to 140 pounds per cubic foot. Following this the mat was sealed with RC-4 asphalt at 0.33 gallon per square yard for a width of 24 feet and stone chips of ¾-inch maximum size spread at 20 pounds per square yard or 141 tons per mile. These were rolled at once by a steel-wheel tandem roller and then the Littleford distributor, with a shortened spray bar, went back and sealed the outer 8½ feet on either side at the same rate of application as the tack coat for the chip seal.

New Construction

The 10-mile section of new construction was built with a 6-inch pit-run base and a 2-inch leveling course, using crushed gravel with a maximum screen size of 1 inch. The mat was mixed in the same manner as the mat for the old reworked section but the aggregate was a crushed disintegrated granite and MC-3 asphalt was used for the binder. The 33-foot mat was 2 inches thick as spread and compacted and the seal 24 feet wide with the tack coat carried to the full 36-foot width, using RC-4.

Other Features of Work

The contractor installed his own gravel plant for the production of crushed gravel for the leveling course and for the chip seal. This Pioneer No. 34V Duplex crushing plant was located in a pit which required an average haul of 4.8 miles for the stone chips for the reworked job and a shorter haul for the new operations. When crushing chips, the reject was a coarse sand which was later used by the Maintenance Department of the Wyoming State Highway Department for a sand seal on old roads. All gravel for the base, as well as the material for the new mat, was required to be weighed on 15-ton scales installed by the contractor. All oil delivered to the job was similarly weighed as a check on the delivery of the complete load when the tank truck was operating on a grade.

At the point where the new access road to Fort Warren, on the outskirts of Cheyenne, enters the new construction on U. S. 30, the first accelerating and decelerating lanes in Wyoming were constructed. These are each 800 feet in length and 12 feet wide, located on the north side of the road adjacent to the access road.

Every care was taken in the design of this project to have it comply with the most forward-looking features of highway design. One curve of 3 degrees

(*Concluded on next page*)

Wyoming SN Highway Improved and Rebuilt

(*Continued from preceding page*)

is spiralled; all others are one degree or under, while all the curves, no matter how flat, are superelevated for the fastest traffic that may be required to travel them.

Contour ditches have been plowed at the top of every cut to take care of the surface water from melting snow and rains. These replace the old ditches cut a prescribed distance back from the top of the slope and which resulted in erosion of the ditch itself. Similarly, the slopes of all earth cuts are harrowed to a depth of 6 inches on the contour and the slope left rough to catch snow in the winter and to retain the maximum of moisture on the slope to aid in germinating the seeds that are blown into the furrows and thus rapidly stabilize the slopes with natural ground cover.

In order to push this job to completion as rapidly as possible, the contractor worked during the 17 daylight hours from 4 a.m. to 9 p.m., resulting in excellent progress being made on both sections.

Major Quantities

The major estimated quantities on the two sections of this project are given separately below:

RECONSTRUCTED SECTION, STATE PROJECT 2003

Excavation	3,600	cu. yds.
Overhaul	4,000	cu.-yd.-sta.
Watering, embankment and detour	100	M-gals.
Scarifying and windrowing surfacing materials	3.8	mi.
Reshaping base course	3.8	mi.
SC-4 distributed	40,000	gals.
MC-0 base treatment	37,000	gals.
RC-4 seal coat	31,000	gals.
Stone chips	570	tons
Processing roadway	75,000	sq. yds.
Watering base	280	M-gals.
Roller operation on base	120	hrs.

The contract price for this section of the project was $19,952.00.

NEW SECTION, SN-FAP-46(7) 1941

Excavation	318,000	cu. yds.
Overhaul	175,000	cu.-yd.-sta
Cubic-yard-mile haul	25,500	cu-yd.-mi.
Watering, embankment	3,550	M-gals.
Sheepsfoot roller on embankment	1,380	hrs.
Pneumatic-tire roller operation, embankment	750	hrs.
Excavation, culvert	1,435	cu. yds.
Corrugated-metal culvert pipe, 18-inch	152	ft.
Corrugated-metal culvert pipe, 24-inch	1,562	ft.
Corrugated-metal culvert pipe, 36-inch	88	ft.
Corrugated-metal culvert pipe, 60-inch	76	ft.
Corrugated-metal culvert pipe, 84-inch	224	ft.
Corrugated-metal pipe, perforated	1,700	ft.
Excavation, drains	230	cu. yds.
Stone for drains	230	cu. yds.
Standard right-of-way fence	66,000	ft.
Portable snow fence	6,832	ft.
Removing and re-laying oil-mixed gravel surface	14,500	tons
Crushed-gravel surfacing, ¾-inch maximum	5,500	tons
Crushed-gravel base course, 1-inch maximum	15,500	tons
Stone chips	1,400	tons
Base treatment, MC-1	83,500	gals.
SC-4 distributed	39,000	gals.
MC-3 distributed	59,000	gals.
RC-4 seal coat	71,000	gals.
Processing roadway	193,500	sq. yds.
Watering base	500	M-gals.
Roller operation on base	200	hrs.
Shaping and tamping oil-mat curb	10,000	ft.
Shaping and tamping spillway	200	ft.

The contract price for this section of the project was $161,122.00.

Personnel

These two adjacent contracts operated as one by the contractor were awarded to the Wyoming Construction Co. of Laramie, Wyo., for which Ed Tynsky was Superintendent for the two jobs. For the Wyoming State Highway Department, the work was under the direction of Frank Kelso, Superintendent, State Highway Department, with J. E. Lloyd as Project Engineer.

Westinghouse Appoints S. A. Representative

The appointment of Adolfa Alvarez as general South American representative of the Westinghouse Electric International Co. has recently been announced. Mr. Alvarez, a citizen of Argentina, will devote special attention to the formulation of plans to put all company activities in the South American countries in a position to meet war emergency conditions as well as post-war requirements. Mr. Alvarez, who is also Vice President of Cia. Westinghouse Electric International, a South American subsidiary of the International Company, will make his headquarters in Buenos Aires, Argentina.

Better Care of Saws

Modern tools have made man's work easier and speedier, but if these modern tools do not receive the proper care, the investment in them is quickly lost. Saw Manual No. 2, issued by The Porter-Cable Machine Co., 100 Wolf St., Syracuse, N.Y., contains 22 pages of information on the use of Speedmatic electric hand saws, some ideas for saving money with them, estimating data, information on the care of saws, and other data of particular use to the contractor who is trying to cut costs but do better work at the same time.

A copy of Saw Manual No. 2 will be sent free by the manufacturer to readers of CONTRACTORS AND ENGINEERS MONTHLY who mention this item.

The new York heater for warming up engines in cold weather.

A New Engine Heater For Cold-Weather Use

Sub-zero or even ordinary mid-winter temperatures frequently make it tough to get the engines of heavy equipment started. This is hard not only on the disposition of the man who has to do it but also on the starter mechanisms, the battery, and the motor itself. A small compact engine-preheating unit to speed up cold-weather starting has been developed by the York Heat Division of Thos. Shipley, Inc., York, Pa. Although designed originally for use on Uncle Sam's airplanes, this unit is equally applicable to such heavy-duty equipment as snow plows, tractors, shovels, trucks and similar machines operating in cold weather.

The unit, which weighs only 38 pounds and can be carried around like a suitcase by one man, produces 90,000 Btu of heat per hour and utilizes 92 per cent of all the heat units in the burning gasoline it uses for fuel. The manufacturer states that it not only speeds up cold weather starting, but also saves a lot of motor wear.

A special booklet describing the applications of this new heater may be secured direct from the manufacturer by mentioning this item.

Expansion-Bolt Catalog

A new 20-page catalog presenting helpful data for users of all types of expansion anchoring devices is available without obligation from the Chicago Expansion Bolt Co., 2240 W. Ogden Ave., Chicago 12, Ill. The items covered by this new catalog, which is completely illustrated with full installation instructions, include expansion bolts and nuts, anchoring devices, toggle bolts, lead wood-screw and lag-screw shields, single and double machine-bolt shields, hook bolts and drilling devices.

Copies of this handy guide may be secured by interested readers of CONTRACTORS AND ENGINEERS MONTHLY direct from the manufacturer.

Bartlett & Snow Appoints New Philadelphia Dealer

Announcement has been made by C. O. Bartlett & Snow Co., Cleveland, Ohio, of the appointment of Martell & Ferree, 1505 Race St., Philadelphia, Pa., as sales representative for its line of materials-handling and conveying equipment in the Philadelphia territory, comprising Delaware, southern New Jersey, and eastern Pennsylvania.

Care and Maintenance Of Motors and Generators

The importance of a regular preventive maintenance schedule in keeping electric motors and generators functioning properly and at top efficiency is the subject of a recent bulletin issued by the General Electric Co. Included are general information on motors and generators, maintenance recommendations, suggestions for a preventive maintenance inspection schedule, a list of instruments needed for proper maintenance, and detailed information on disassembling and assembling operations.

Copies of "How to Maintain Motors and Generators" may be secured from General Electric Co., Schenectady, N.Y.

Concrete Placement At New Filter Plant

A 6-Mgd Supplementary Plant at Lee Hall, Va., Serves Newport News Area In War Emergency

(*Photos on page* 68)

✦ THE old water filtration plant of the Newport News, Va., Water Commission at Lee Hall, Va., had a nominal capacity of 8 mgd but was able to deliver dependably only 6 mgd of filtered water. With the demand for more water by manufacturing and military establishments in this area it became necessary to enlarge the Lee Hall plant. (See C. & E. M., July, 1943, page 1.) Newsom & Aldrich, Engineer-Consultants for the Federal Works Agency, prepared plans and supervised construction of a 6-mgd supplementary filter plant and a new 3-mg clear-water basin. After construction of these was completed, the old plant was overhauled and brought up to full capacity.

Concrete Production

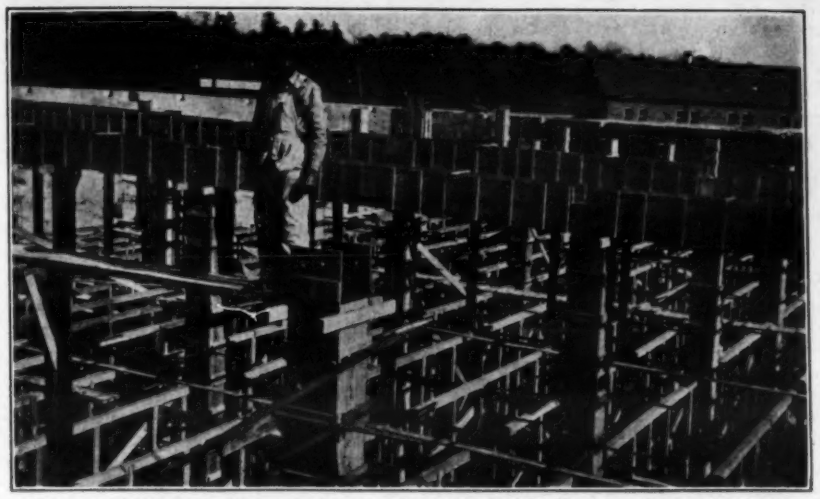
Gravel aggregate for concrete was delivered by rail in hopper-bottom cars to the coal trestle of the pumping station and unloaded to the boot of a portable belt unloader powered by a Wisconsin motor. This delivered the material to a stockpile from which it was moved to the proper hopper of the weighing batcher plant by a steam crane with a Hayward 1-yard clamshell bucket. The aggregate cars were moved along the trestle by the winch on the steam crane. Sand was delivered to an adjacent stockpile by truck and rehandled by the same crane and bucket.

The batches were weighed out in the proper proportions to give a mix of 5½ bags of cement per cubic yard of concrete and delivered to the three 2½ and 3-yard Jaeger truck mixers.

After having received the batch of weighed aggregates at the plant, the trucks drove over a circuitous route to the cement shed on an adjacent siding where, for small pours, two men emptied the proper number of bags of cement into the truck mixer before it proceeded to the site of pouring. On large pours a platform was built nearer the batching plant where the cement was moved direct from the hauling trucks which ran up a ramp and four men emptied the sacks into the truck mixers.

Placing Concrete

The truck mixers backed as close to the point of pouring as was expedient and delivered their loads to the four buggies which were operated over a runway 5 feet wide built with variable-width planks placed transversely with 1 to 2-inch spaces between. The runways were supported by pairs of 4 x 4-inch posts tied by 1 x 6-inch lumber. During the pouring operation, the concrete was vibrated, with one man handling the vibrator in the concrete and a second man moving the portable gas-engine-driven power plant, resulting in excellent concrete work with a complete absence of honeycomb. One hand puddler was used.



Close-up of the roof columns and beams for a 173-foot-in-diameter clear-water basin, part of the addition to the Lee Hall, Va., water filtration plant.

The 3-mg clear-water basin 173 feet

(*Concluded on page* 67)

A P & H crane aids in the assembly of motor trucks somewhere in Iran.

U. S. Cranes Speed Equipment to Russia

Somewhere in Iran, General Motors experts working for the U. S. Army have developed long Detroit-like assembly lines from which flows a steady stream of American trucks and armored cars at the rate of one every four minutes. Using modern materials-handling methods to the fullest extent, these operations are aided by a fleet of P & H crawler cranes for hoisting and handling parts during the assembly of these units.

Two-thirds of the trucks are turned over to the Russians who load them to capacity with other war materials and drive them through the Persian corridor into Russia. The remainder goes into large fleet pools which shuttle between Iran's unloading wharves and Russia's acceptance centers.

Accident Facts

The 1943 edition of "Accident Facts" has just been issued by the National Safety Council. This statistical yearbook, which has most of the answers to safety questions, is this year geared to the war effort in the nation's drive to conserve manpower vital to victory.

Although the report shows that accident records of war workers are better in this war than they were in World War I, work accidents killed 18,500 persons in 1942. Of this, 3,100, or 17 per cent, were in the construction industry.

Copies of the 1943 "Accident Facts" may be secured by those interested direct from the National Safety Council, Inc., 20 No. Wacker Drive, Chicago 6, Ill. Price: 50 cents a single copy.

New Production Manager For Athey Truss Wheel Co.

The appointment of R. J. Nadherny as Production Manager has recently been made by the Athey Truss Wheel Co., Chicago, Ill. In making this announcement, C. K. Davis, Athey President, said that increased volume and changing conditions had been imposing overloads on the present Athey organization and that Mr. Nadherny had been added to the organization to correct this situation. It is believed that the segregation of manufacturing from engineering and development activities will amplify Athey's capacity in both divisions.

Mr. Nadherny has had 20 years' experience with equipment similar to the products manufactured by Athey.

Standard Field Office Designed by County

(*Continued from page* 45)

ties, and character.

Drawing 16708 of the Allegheny County Department of Works, Bureau of Design, bearing the title "Standard Engineering & Inspection Building", gives complete plans, sections, and elevations for the field office building. Through the courtesy of the Bureau of Design, we have reproduced the standard floor plan for field offices.

Personnel

John B. Sweeney is Director, Allegheny County, Pa., Department of Works. The plans and specifications for the demountable field office were prepared by the Bureau of Design, of which Charles F. Houlihan is Assistant Chief Engineer in charge. S. A. Shubin is Bridge Design Engineer, S. M. Madancy is Road Design Engineer, and H. G. Appel, Specifications Engineer.

New Method of Attack On Ohio Snow and Ice

(*Continued from page 27*)

tures occur after the snow has fallen. It was reasoned that if the chemicals were applied in the early stages of a storm, or before the temperatures had started to fall, the small amount of snow on the pavement would be melted or, at least, would be prevented from packing. Past experience had shown that none of the commonly used chemicals were immediately effective at extremely low temperatures. In fact, the chemicals used seemed to have a limited effect on packed snow or ice at sub-zero temperatures.

Method of Attack

When conditions indicate the approach of a storm, the Divisions are notified in advance so that all equipment may be held in readiness. As soon as the night watchman or superintendent observes that it is snowing, and the snow is not melting from the pavement, equipment operators are instructed to report immediately to the county garages or outposts, and when approximately ½ inch to 1 inch of snow is on the pavement, trucks loaded with raw chemicals are sent out on the various roads. The men are instructed to follow a definite sequence of operations based on the priority of roads which have been previously classified according to their importance. This classification has been established for all State and Federal highways in Ohio and has been found to be of great assistance in the movement of traffic during the winter months.

The equipment operators then spread raw chemicals on the snow-covered pavement, at rates varying from 200 to 400 pounds per mile, proceeding from the more important roads to those of less importance. If there has been no serious drop in temperature, and the chemicals are applied promptly, the snow melts and leaves a clean pavement. If, however, the temperature drops and snowing continues, it has been found that the chemicals prevent the packing of the snow and leave it in a mealy condition which is not hazardous to traffic. In cases of extremely heavy snows the chemicals which have been applied in the early stage of the storm are concentrated at the bottom near the pavement, and it has been found that when snow plows remove the excess snow down to a depth of about 1 inch, the remainder of the snow will either be melted by the action of the chemicals or stay in a mealy condition. It can be seen that in order to be effective it is absolutely necessary that the chemicals be applied promptly, and the snow treated before it has a chance to pack and before the temperature drops so low that the effectiveness of the chemical is nullified.

The method outlined above has shown that one truck loaded with chemicals may cover as much as 10 miles or more of pavement, whereas one truck-load of treated abrasives rarely could take care of more than 2 or 3 miles of pavement. The saving on equipment and tires is obvious.

Problem of Ice Storms

Ice storms are another problem. Most of these are caused by rain falling on cold pavements, the rain freezing on contact with the pavement, causing a glare of ice. In such cases snow plows are useless. However, experience has shown that prompt treatment with chemicals, applied before a serious drop in temperature occurs, causes the ice to become rotten or disintegrated under traffic. Many of these storms leave only a very thin film of ice, and in such cases lesser quantities of chemicals are needed than with heavy snows.

The question naturally arises as to the effect of these concentrated chemicals on concrete pavement. In order to protect the pavements from the deteriorating effect of chemicals, the field forces have been instructed to use the raw chemical method of treatment on all except new concrete pavements less than four years old. Apparently the deteriorating effect of chemicals on older concretes is negligible. Where new concrete pavements were treated with a linseed-oil emulsion before being opened to traffic, the application of chemicals is permitted. Research is now being carried on in the treatment of new concrete pavements with materials which are more easily obtainable than linseed oil under war conditions. It is hoped that this research will develop satisfactory results so that all types of pavement can be treated uniformly.

Several methods and devices for applying raw chemicals have been used. The spinner type of spreader has been found effective and a slotted tail-gate with shut-off slides has also been used. On some of the narrow roads it has been found that spreading the chemicals by means of a vertical spout with a funnel-type hopper on the top and a baffle board at the bottom of the truck is just as effective. Undoubtedly with more experience some standardized piece of equipment will be devised.

Savings

The use of chemicals in Ohio has been most effective in saving man-power. Not only is there a saving in time and the number of men needed for loading abrasives, but the extra man required on each truck to move the sand or cinders down to the spreader is not needed when raw chemicals alone are used because they flow so easily. Inasmuch as one truck-load of chemicals covers so much more pavement than a load of treated abrasives, there is a considerable saving in truck mileage. Another advantage is that a much longer mileage of roadway can be treated with the chemical alone, and in a shorter space of time, than with chemically treated aggregates.

Every storm is a separate problem and it is a little too early to draw definite conclusions regarding the continuing value of the use of chemicals alone, because the past season was one especially favorable to their use. Time and again it has been noted that sections of main highway treated with chemicals have been bare and wet within 15 minutes of the end of a snowfall.

Personnel

H. G. Sours is Director, Ohio Department of Highways, with the author in charge of snow removal and ice control as well as the regular summer maintenance operations.

Poole Joins Keystone Staff

James Poole has recently been appointed to the sales staff of Keystone Asphalt Products Co., according to a recent announcement. Mr. Poole will assist T. R. Johnson, the company's Sales Manager, in national sales work and will make his headquarters in the firm's Chicago office.

Road Maintenance In Nutmeg State

Connecticut Report Shows Lower Maintenance Costs Due to Better Highways And Modern Methods

✦ THE great change in maintenance methods of the Connecticut State Highway Department during recent years is summarized in the Biennial Report of State Highway Commissioner William J. Cox for the years 1940-42. The report points out that not a great many years ago the quality of roads was such that they required almost continuous minor repairs. Surfaces were of types requiring constant attention, and bases were inadequate and poorly drained, with the result that each spring large mileages of roads broke up and had to be extensively reconditioned.

As a consequence of the substantial amount of reconstruction of older and poorer roads, and of the programs of armor coating and subsurface drainage, this condition has radically changed. Now Connecticut maintenance is very largely constructive or what used to be called "maintenance betterments". This consists primarily of improvements, not large enough to be handled by contract, which do more than repair damage, and which are corrective to prevent the occurrence of damage.

Recent Improvements

Armor-coat operations during the biennium covered by the report provided new surfacing for 291 miles of waterbound-macadam and oiled-gravel roads. In addition to this, other types of older roads, such as bituminous-macadam, reinforced-concrete, etc., have been given armor-coat surfaces, such work accounting for another 132 miles during this two-year period. Between June 30, 1942, and November 30, 1942, an additional 181 miles of waterbound-macadam and gravel and 73 miles of other types have been armor-coated.

Armor-coat operations in Connecticut consist of the application of RC-5 asphalt, or an emulsion, at 0.25 gallon per square yard, covered with ½-inch crushed trap rock, or 0.33 gallon of the same asphalt and ¾-inch chips. The chips are applied at rates of 20 or 30 pounds per square yard by an under-truck belt-conveyor-type spinner, which was described in detail in a previous article. (C. & E. M., Feb., 1943, page 33).

In recent years 873 miles out of a total of 1,440 miles of waterbound-macadam and gravel roads on the state highway system have been armor-coated. The mileage of other types armor-coated amounts to 214.73, making an aggregate of 1,088.08 miles of armor coat on all types of roads. This work is reported to be producing substantial savings in maintenance.

The subdrainage work of the Department, some of which has been done to modernize the roads before they are armor-coated, used a total of 103,520 linear feet, or nearly 20 miles, of perforated pipe during the biennium. (C. & E. M., Oct., 1940, page 17). Between July 1, 1942, and November 30, 1942, an additional 19,614 feet were installed. Well over half of this pipe was in the 8-inch size, with the remainder distributed through several sizes from 6 to 18-inch.

As the elimination of annual oiling of the roadways approaches completion, the opportunity is offered to develop more economical maintenance practices for shoulders. Connecticut pioneered wide and hardened shoulders for safety, and stuck to two-lane roads with ample shoulders at a time when other states were building three-lane roads, frequently with shoulders inadequate as to width, smoothness and solidity. However, three-lane roads are now very generally condemned throughout the country. The Army, in establishing standards for the design of strategic-network highways, specified shoulder construction very comparable to the standards used in Connecticut for roads of like service requirements.

Maintenance Costs

The trend of highway maintenance cost per mile of road in Connecticut has continued downward during 1940-42, as in the three previous years. The report points out that, in view of the substantial increases in wage rates during that period, this downward trend is an accomplishment reflecting great credit on A. L. Donnelly, Director of the Bureau of Roadway Maintenance, on his supervisory staff, and on the employees of the Department.

The cost of snow removal and sanding was up sharply in the trying winter of 1940-41, but was reduced again in 1941-42. These costs are largely determined by climatic conditions. Overall road-maintenance costs for 1941-42 were the

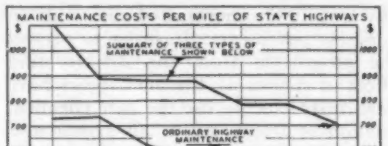


Chart showing maintenance costs in Connecticut.

lowest achieved in a great many years. At just over $700 a mile, they were less than two-thirds the cost 6 years earlier. All state highway maintenance costs, for roadways, roadsides, bridges, and ferries, were only 3.5 per cent greater than they were 11 years earlier, in spite of a 26.5 per cent increase in the mileage of the state highway system, a large part of which increase has been four-lane road.

Maintenance Districts

On the basis of the kind of work which typified maintenance 15 or more years ago, the state was divided for state highway maintenance purposes into eleven maintenance districts, each in charge of a district supervisor. Such a division was doubtless logical, considering the type of maintenance and supervision called for at that time.

Present roadway conditions and maintenance problems, however, make it more efficient to have a considerably smaller number of individually larger maintenance districts, each in charge of a supervisor, with a general foreman to take direct control over the combined gangs through which much work is now done, and to be a general assistant to the supervisor. This revised organization had been tried out through the consolidation, in 1940, of two districts into one. The innovation was successful, and the number of districts has been reduced from ten to six. Such a reduction has the additional advantage of making the maintenance districts substantially co-extensive with the six residencies into which the state has been divided for construction purposes, thus bringing the maintenance supervisor into closer touch with the resident engineer of construction.

Eventually it is to be hoped that the present separate offices of the supervisors and the resident engineers can be consolidated in a single highway-department building in each of the six areas, but that is a development which will, of course, have to await the end of the war.

Timely Tips for Operators Of Excavators and Cranes

The productive life of any excavator depends largely on the care given it by the operator. In order to extend the working life of shovels, cranes, and draglines now in service, the Shovel & Crane Division, Lima Locomotive Works, Lima, Ohio, has prepared a handy and helpful booklet entitled "Timely Tips for the Shovel, Dragline and Crane Operator". The booklet contains instructions for the lubrication of all parts, servicing and adjustments, stresses the importance of clean fuel oil with information on how it can be achieved, and discusses the proper care of wire rope.

Copies of Timely Tips, which contains in addition a list of Lima service stations where repair parts are available, may be secured direct from the manufacturer. The booklet also contains an invitation to submit any questions on the care and upkeep of Lima excavators not answered in the booklet direct to the company's Service and Parts Manager.

Heavy-Duty Trailers

The wide variety of La Crosse heavy-duty trailers made by the La Crosse Trailer & Equipment Co., La Crosse, Wis., is described in a series of bulletins, punched for loose-leaf binding, each of which is devoted to one of these models. Included are three models of 4 and 6-wheel skeleton types for hauling power shovels and similar equipment; three general-utility trailers with two axles and four wheels; two models with single front axles, tandem rear, and six wheels; three models with two rear oscillating axles and six wheels; Model DF12 for very heavy jobs; several semi-trailer models and three types of reversible units for 11 to 100-ton loads.

Copies of these bulletins may be secured by those interested direct from the manufacturer by mentioning this magazine.

Army-Navy "E" Awards

The following companies have recently received Army-Navy "E" Awards for excellence in production: Cleveland Tractor Co., Cleveland, Ohio; the LeTourneau Co. of Georgia, Toccoa, Ga.; the Link-Belt Ewart plant in Indianapolis, Ind., and the Link-Belt Ordnance Co., Chicago. A second "E" Award signifying continued excellence in the production of wire rope and cable has been received by the Macwhyte Co., Kenosha, Wis.

A new gang mower developed by the Army for the speedy mowing of airfields.

Army Airfield Mower Cuts a Wide Swath

A huge lawnmower that covers ground five or six times as fast as the largest ones used on golf courses has been developed by the Corps of Engineers, Army Service Forces, for use on airfields. Towed behind a weapons carrier, the new mower cuts a swath 21 feet wide at a top speed of 20 miles an hour. Test runs indicate it can cut 40 acres of weeds and grass an hour.

The design of the new mower, which weighs 4,500 pounds, was worked out by the Repairs and Utilities Branch of the Office of the Chief of Engineers. There are nine sections to the mower, which operate under wheel traction with flail-type blades rotating flat against the ground.

Grass is desirable on airfields, as it keeps down the dust otherwise raised by propeller "wash". However, grass cutting is a problem on busy small-trainer fields, where hundreds of planes may be in the air at one time and ships constantly land and take off, sometimes across the grass as well as on regular runways. In consequence, a grass mower must do its job in a hurry and get out of the way.

Research Study on Soils

A report of an investigation conducted by the Engineering Experiment Station, Purdue University, and the State Highway Commission of Indiana has recently been published as Research Bulletin No. 87. Entitled "The Formation, Distribution, and Engineering Characteristics of Soils", this study was made by D. J. Belcher and L. E. Gregg, Research Engineers, and K. B. Woods, Assistant Director of the Joint Highway Research Project, the function of which is to make basic studies of materials and methods for the purpose of facilitating the economic design, construction and maintenance of highways; to make miscellaneous studies; and to provide experience and advanced instruction in the fundamentals of highway engineering and related research.

The purpose of this Bulletin 87 is to present data on the engineering properties of pedological soils, to correlate these properties with the performance of highways in relation to subgrade, embankment and foundation, and, when possible, to indicate methods of improving poor or unsatisfactory soils. Although all of the work done in this connection has been on soils in Indiana, much of the data will be of use in a number of states covered with glacial drift or of similar geological structure and having a similar climate.

Copies of this Research Bulletin No. 87 may be secured from the Engineering Experiment Station, Purdue University, Lafayette, Ind. Although the list price of this bulletin is $1.00, there is a limited number of copies available gratis to engineers outside of Indiana.

New Skilsaw Works Mgr.

Announcement has been made by Skilsaw, Inc., Chicago, Ill., of the appointment of J. J. Topolinski as Works Manager, to succeed L. E. Parker, Vice President, who recently resigned. Mr. Topolinski has been associated with Skilsaw for the past 11 years and, until his recent promotion, had been Superintendent under Mr. Parker since 1940.

Roadside Planting For Erosion Control

(*Continued from page* 36)

On these slopes there were isolated sections where the sod had broken away from the ground, but in general the staking of the sodding has proved most successful in holding it on the high slopes, even during the very wet weather of the past two years. Where there were breaks, there seemed to be only a horizontal tear some 10 feet long and a bulging of the sod at the bottom, in some cases pushing out over the paved side ditch for a distance of 12 to 18 inches. These were repaired by restaking the sod and resodding at the breaks.

Rye Grass and Sweet Clover

Considerable use has been made of domestic rye grass on experimental projects in the past two years in place of rye, wheat, or oats as a nurse or cover crop on seeded slopes. Information on the use of domestic rye grass is limited and most of the planting has been done in the southern three-quarters of the state, roughly, south of U. S. 24, but because of the success attending these plantings, a small amount of experimental work is being done in the northern tier of counties to ascertain its adaptability there.

Domestic rye grass seed is usually mixed, both perennial and annual grasses being included, and develops a temporary sod, being followed by hardier grasses. When mowed before jointing, stooling out is promoted, but late mowing, particularly in dry weather, often completely kills the entire stand of rye grass.

Sweet clover, considered in some states as a rank weed to be eliminated from roadsides if possible, has been used effectively for erosion control on gravelly cuts in Indiana because its deep tap root prevents slipping of the top soil and because it is one of the very few plants which will grow in such locations. The yellow clover, melilotus officinalis, is preferred to the white, since its growth is less tall and rank. Scarified seed is desirable to assist early germination. Since the plant is biennial, mowing after the seed stems start may prevent the re-seeding necessary to keep a continuous cover.

Use of Lespedeza

Korean lespedeza has been used on shoulders in the southern section of Indiana with considerable success. It has a tendency to reseed, working down the foreslope and then up the backslope. It grows well in poor soil, such as the heavy clay in southern Indiana, and grows where no other type of vegetation thrives.

The method of mowing and mulching with lespedeza hay has proved very effective in rapidly extending the growths. Wherever the lespedeza cuttings are available and there are any bare slopes nearby, they are mulched with the cuttings, resulting in rapid spreading of the lespedeza growth.

Will you have the right to cheer when the boys come home? You won't unless you back them up with War Bonds.

The new Katolight 25-kw revolving armature generator.

New 25-Kw Generator Added to Kato Line

After many months of research followed by actual testing, Kato Engineering Co., Mankato, Minn., has announced the addition of a 25-kw Katolight generator of the revolving-armature type to its line of generators, light and power plants, rotary converters, frequency changers, and motor generator sets.

The new Model 55 Katolight generator has a rated capacity of 25-kw at 80 per cent power factor, single phase, or 30-kw at 80 per cent power factor, three phase. The unit is 38 7/32 inches long, 24½ inches wide, and 25¾ inches high, and weighs approximately 1,375 pounds. It is available in standard or special voltages, either straight 110, 220 or 440 volts single phase or 115-230 or 220-440, four ring, single phase. It is also available for straight 110, 220 or 440, three wire, three phase, or 120-208 four wire, three phase. It has inherent voltage regulation of approximately 10 per cent between no load and full load with 3 per cent speed change.

Full information and further details regarding this new revolving-armature-type, separately excited, six-pole, 1,200-rpm unit with damper windings may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Several Personnel Changes At Universal Atlas Cement

Announcement has been made by the Universal Atlas Cement Co., subsidiary of the U. S. Steel Corp., of the retirement of Thomas A. Hicks, General Chemist, after more than 38 years of continuous service with the company. Mr. Hicks was in charge of the original investigation of Atlas White and Atlas Luminite cement, as well as a number of other Universal Atlas products.

G. L. Lindsay, former Engineer of Tests, has been made Assistant Director of Tests and Research; F. P. Diener, Assistant General Chemist, has been appointed Chemical Engineer; and C. L. Davis, formerly Assistant Engineer of Tests, has been promoted to the position of Engineer of Tests.

Oklahoma Road Job Beset with Difficulties

(*Continued from page* 33)

railroad cars directly into the batch trucks.

The 37-cubic foot batches were made up of 2,967 pounds of stone, 1,691 pounds of sand, 670 pounds of cement and 5½ gallons of water per sack of cement, and conformed to Oklahoma standard specifications. They were hauled in two-batch trucks to the paver, with an average haul of 3½ miles. The mixing time was one minute.

Pouring and Finishing

In paving the first lane, the 34-E MultiFoote paver operated outside the forms, but on the second lane it worked between the forms as traffic had to be maintained along the road at all times. The concrete was spread and finished by a Jaeger-Lakewood finishing machine, equipped with a Jackson vibrator. A hand vibrator was used along the sides of the forms and at all expansion joints.

Next came the Flex-Plane machine to install the center joint, and then the longitudinal float, followed by 10-foot straight-edges and two belts. The joints were finished and edged by two finishers.

The specifications called for a 6-inch black line down the center of each slab. As soon as the water had disappeared from the surface of the concrete, a template was set in the center of the pavement and black oxide of iron was spread in the template at the rate of 3 pounds per 100 feet. This was worked into the surface by a finisher with a hand float. A membrane curing compound was sprayed on the concrete by a small power pump at the rate of one gallon per 30 square yards of surface.

One Bridge on Job

The only bridge on this contract spans a creek near the center of the project. Some difficulties were encountered in its construction, due principally to the impossibility of securing some of the materials called for in the original plans. The original design provided for 30, 50, and 30-foot steel I-beam spans, involving the use of 140,000 pounds of steel. Because of the steel shortage, it was necessary to revise the plans, after construction on the highway had started, specifying 35, 40, and 35-foot reinforced-concrete girders.

By this substitution, a saving of 130,000 pounds of structural steel was accomplished. However, the change in design necessitated the use of 51,000 pounds more of reinforcing steel than originally required, but resulted in a net overall saving of 79,000 pounds of steel.

The bridge is 111.4 feet long and 55 wide from curb to curb, with a concrete hand-rail on each side. In the center is a 4-foot island with rounded curb, 3½ inches high. Inside the hand-rail on each side is an 18-inch wide concrete curb for pedestrian traffic.

The abutments of the bridge rest on concrete piling varying in length from 30 to 40 feet. One of the piers is set on timber piling, and the other pier rests on three concrete footings varying 14 feet in elevation to conform to the slope of the shale foundation. This substructure was not changed from the original plans for the bridge.

Work stoppages, due mainly to wet and freezing weather during the autumn and winter, delayed completion of the bridge and final stretches of paving for several weeks.

Some Other Difficulties

Some time was lost in receiving materials shipped to the batching plant by rail because of the abnormal demands on the freight transportation facilities. Because of the heavy drain on materials, the contractor had to build up unusually large stockpiles, which caused extra handling of materials. Another cause of delay was the necessity of maintaining one-way traffic during certain hours on the auxiliary asphalt-paved road over which some of the batches were hauled to the paver. Another handicap was the scarcity of repair parts for the trucks and other equipment.

But Old Man Weather, over which the best-organized contractor has no control, was responsible for most of the delays and difficulties encountered by the contractor on this project.

Personnel

L. R. Moran and J. T. Buckner are the principals of the firm of Moran & Buckner, Muskogee, Okla., which held the general contract for this work. Frank Fitch was Superintendent on paving for the contractor in the final phases of the work, succeeding Paul Laws, who served as Superintendent after the resignation of John Lyles, Lieut-Commander, U.S.N.R., when he was called for active service. C. H. Bledson was Bridge Superintendent.

J. R. Keeth was Resident Engineer for the Oklahoma State Highway Commission, for which the late Van T. Moon was Chief Engineer, and V. E. Green was Inspector. B. E. Clark succeeded Mr. Moon as Chief Engineer before the project was completed.

Never has the proper care of equipment been so important. The machines you now have must last for the duration, so take care of them.

C.I.A.A. Photo
Workers on a rocky portion of a new strategic highway in Brazil.

Financing Road Work In Georgia Counties

The gas tax is still the backbone of finances for the construction and maintenance of highways and roads in Georgia even though the income has dropped nearly 30 per cent. Prior to the enactment of a new fiscal law by the last legislature, the 6-cent state gas tax was divided as follows: 4 cents to the state highway department; 1 cent to the counties on the basis of state highway mileage in each county; 1 cent to state education. The money from the license fees for motor vehicles all went to the state highway department direct.

This law was amended by the last legislature to require that all funds must go to the state treasury and be appropriated therefrom by the legislature. The counties are strong enough politically in Georgia to see that the equivalent of the 1 cent from the gas tax is appropriated for county road work. The method of allotting the money, on the basis of the number of miles of state highway in each county, irrespective of the size of the county or of the number of miles of county roads that the subdivision has to maintain, has been retained. This has led to a ridiculous race on the part of the counties to see which one can increase its "take" in the appropriation by getting the State Highway Board to accept the greater mileage of county road as part of the state highway system.

In the fiscal year ending June 30, 1943, the mileage of the state highway system was increased 745 miles to 13,969 miles by this method. This competition has reached new proportions with the "prize" county being reported in the newspapers of the state. A total of $4,340,000 from gas-tax funds was distributed to the counties last year on this basis. Of course, it should be pointed out, as the appropriation to one county increases, the funds going to the other counties must automatically be decreased, as the total funds for distribution are not increased.

The largest increase went to Macon County, with 70 miles added to the state highway system. Other large increases were 14 miles in Effingham County, 14 in Emanuel County, 25 in Fayette, 34 in Fulton, 26 in Jasper, 11 in Jefferson, 13 in Liberty, 23 in Lincoln, 12 in Marion, 16 in Mitchell, 12 in Murray, 14 in Newton, 14 in Peach, 18 in Schley, 25 in Screven, 19 in Sumter, 18 in Taylor, 15 in Telfair, 11 in Troup, 15 in Warren, 17 in Washington, and 12 in Wilcox.

The counties that received the largest share of the state gasoline taxes, intended for work on secondary or feeder roads, were: Carroll, $51,078; Clinch, $46,637; Coffee, $41,394; Dodge, $43,077; Emanuel, $53,052; Fulton, $55,205; Harris, $40,356; Jefferson, $45,649; Laurens, $52,694; Lowndes, $47,781; Macon, $42,936; Meriwether, $43,642; Mitchell, $48,357; Monroe, $41,536; Telfair, $45,349; Thomas, $56,308; and Ware, $43,692.

These are the contributions made by the state to the counties for road work in the counties; they are not the total funds expended by the counties on their roads. For example, the report of Fulton County for the fiscal year ended October 31, 1942, which includes a portion of the period reported above for the distribution of state gas-tax money, shows $18,781.60 expended for the maintenance of bridges and $190,624.84 spent for the maintenance of roads, exclusive of a small sum for construction in the current year.

In most states where the counties share the gas tax, the proportion allotted to each county is based on the mileage of county roads, the population, and possibly the area of the county. This seems far more equitable than creating a situation where the counties are vying with each other as to which can "dispose" of its roads to the state faster so that its share of the gas tax will increase, with a smaller mileage of county roads to maintain.

Buy U. S. War Bonds regularly.

Rejoins Dewey & Almy

Francis McAdam has rejoined the technical sales staff of the Dewey & Almy Chemical Co., Cambridge, Mass. Mr. McAdam has been serving as Chief of the Non-Metallic Section, Building Materials Division, War Production Board, and, having completed his task of increasing production of concrete materials to meet the emergency needs of the war construction program, felt that he could properly rejoin his former company, to work on new developments of the Portland Cement Division as well as its cement grinding aid known as TDA.

Virginia Road-Fund Loss

If gasoline restrictions are continued for another year, the Virginia Department of Highways expects a further decline of about $5,000,000 in revenues, according to *Highway Highlights*.

Some Hints on Safety In Welding and Cutting

(*Continued from page 42*)

scure crevice and smolder for hours, and then cause a fire long after the cutting job has been finished.

As an added protection to knees, thighs, and waist, many operators wear a light leather apron.

Don't "Dust" With Oxygen

Workmen sometimes use compressed air to blow dust and dirt from their clothing. It is bad practice, but the use of oxygen for this purpose is infinitely worse. A spark or hot particle that has lodged in the fold of the clothing may be smoldering unnoticed. A stream of pure oxygen, by causing the fabric to burst into flame, can easily cause a severe flesh burn, not to mention a ruined garment and a needless waste of oxygen. If you yourself are not guilty of this bad habit but see one of your companions thoughtlessly dusting his clothing with oxygen, you will render him a real service by calling his attention to the hazard.

Use Tongs for Hot Metal

When welding relatively small pieces of metal, keep a pair of blacksmith's tongs handy for turning over or otherwise handling the pieces. Although metals quickly cool sufficiently to lose their red color, they will for a long time retain enough heat to burn the fingers severely if picked up without gloves. Even if gloves are used, hot metal will soon scorch and ruin them. Cultivate the habit of never picking up a piece of metal in the welding shop without first testing it to see if it is hot by touching it quickly. This habit will prevent many a burned finger.

Watch Falling Scrap

You may laugh at the story about the absent-minded chap who climbed out on a limb and sawed himself off, but cutting operators are often guilty of an equally foolish performance—they cut off a piece of steel with a blowpipe and permit the scrap piece to fall on their feet. It is surprising how often this occurs. Before starting a cut, the careful operator will anticipate what will happen when the piece is severed and will govern himself accordingly by making provision to eliminate the possibility of injury, to himself or to others.

While adjusting the work, the regulators, or the clothing, the operator should not lay the blowpipe down on the welding table with the flame lighted—not even for a moment. He or his helper may brush against the flame or the weight of the hose may cause the blowpipe to shift. In either event a severe burn may be sustained. Furthermore, letting the blowpipe burn while it is not in actual use is an unpardonable waste of oxygen and acetylene at any time and is criminal in wartime.

Conclusion

It is hoped that this discussion of a few common-sense precautions will not lead some of the newer welding and cutting operators to believe that the oxy-acetylene blowpipe is a dangerous hazard-breeding instrument, because it is not. Properly handled, it is as harmless as any other piece of shop equipment and has long been recognized as one of the tools of industry. The welding and cutting operator, however, like the operator of a lathe, a punch press, a lawn mower, or an automobile, should observe all ordinary safety precautions.

"All-Out" Scrap Drive

An "all-out" iron and steel scrap drive and the establishment of "Victory Scrap Banks" throughout the country to insure a steady flow of iron and steel scrap to the nation's steel mills were announced recently by War Production Board Chairman Donald M. Nelson.

Consuming steel mills and suppliers had on hand on September 15 an inventory of about 7,500,000 tons, which will last only two months. For this reason a nation-wide scrap salvage campaign was launched on October 1 and will continue through November 15.

The need for more iron and steel scrap is indicated in the production comparison of 1943 against 1942, Mr. Nelson stated, pointing out that the increase in the production of all munitions, all navy tonnage and all merchant shipping is just double that of last year.

The construction industry and highway departments have already contributed great quantities of scrap to the war effort. We say again, do *not* scrap anything which you can salvage for the repair of your present equipment. But *do* put into the fight every bit of idle iron or steel scrap which can no longer work for victory on the home front.

LaPlant-Choate Changes

Recent changes in the organization of the LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa, include the promotion of Sidney L. Myers as Vice President in charge of export and Federal sales. Mr. Myers, with the company for 20 years, has most recently been its Export Manager.

Loiell Hyler, formerly Chief Engineer of R. G. LeToureau, Inc., has been made Assistant Chief Engineer in charge of LaPlant-Choate scraper development.

Films Aid Contractor In Care of Equipment

(*Continued from page 46*)

able reminder as well.

The films have convinced operators of the importance of daily inspections of all equipment, even when everything is going "O.K."

Training New Operators

There is another advantage to the movie hobby, according to Mr. Caesar, and that is in training new men. All contractors are having more experience in training new men than ever before, and many have had to train entirely new crews and then train other crews to take the place of the newly trained men.

Mr. Caesar says that a new man, after a little actual experience operating a machine, can benefit greatly by watching a motion picture of an experienced operator put a similar machine through its paces time after time, and is given confidence to go out on the job and deliver.

Reaping the Reward

Mr. Caesar feels that he is just beginning to reap the reward from harnessing his hobby to his business. Every time the films are shown, he says, some new angle comes to light which results in a better method or a correction which saves equipment or working time.

"I'll agree that a large part of the success of such a plan depends on the hobby idea," Mr. Caesar said. "A hobby which can be turned to a profit must first be fun. It must furnish relaxation. And it must be a hobby which is applicable to your type of business. But when you find this kind of hobby, you have found a real one that's worth its weight in better operation methods.

"I can recommend my miniature movie hobby. I know I have saved many many times the total hobby cost in just one permanent improvement, and there have been many such improvements. We have just begun to scratch the surface."

Burners and Torches

American Fireblo oil burners and torches for general use in highway construction and maintenance are described and illustrated in Bulletin A, copies of which may be secured by interested contractors and state and county highway engineers direct from American Steel Works, 27th & Southwest Blvd., Kansas City, Mo.

The American Fireblo line includes a variety of single and double torch and burner outfits in a number of sizes and styles. In addition there are two types of concrete-mixer heaters to make possible cold-weather concreting. The Fireblo Type A heater is designed for use in tilting mixers, while Type B has a universal attachment for non-tilting mixers and for tilting mixers equipped with power loaders. Both are available in models to suit any mixer on the market.

New Strategic Roads Great Aid to Ecuador

Work is getting under way on two gaps in the Pan American Highway in Ecuador, from Guamote to Tambo, north of Cuenca, and from Loja to Macara, on the border of Peru. When completed, the Pan American Highway in Ecuador will consist of approximately 700 miles of roads, extending from Rumichaca, on the Colombian border, to Macara in the south. This will provide a through connection for the highways of Colombia with those of Peru.

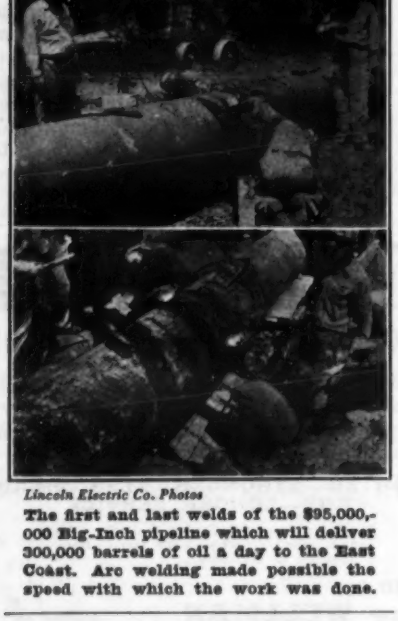
Ecuador likewise is striving for early completion of a 205-mile strategic highway uniting Quito, capital of Ecuador, with the port of Esmeraldas on the Pacific. A stretch of more than 80 miles of this highway is finished and in use. It starts at Quito, at an elevation of 9,500 feet, climbs over a pass at an altitude of more than 12,000 feet, then drops to the town of Santo Domingo, only 1,500 feet above sea level.

Aid in financing highway construction in Ecuador has been furnished by credits from the Export-Import Bank of Washington, which has made available $1,200,000 to complete the Guamote-Tambo section. This supplements a credit of $1,100,000 made in 1940 for work on the Cuenca-Loja road. In addition, out of a general credit of $5,000,000 made available to Ecuador last year, a considerable part is expected to go for highway improvements.

The Export-Import Bank credits augment Ecuador's own appropriation for highway work. In the fiscal year ending May 30, 1943, Ecuadorian appropriations for highway work totaled 7,140,000 sucres, including 3,840,000 sucres for new construction. At present the sucre has a value of 14.1 per dollar.

As in other Andean countries, highway construction in Ecuador often involves difficult engineering feats along tortuous routes and rushing streams. Along the coastal region roads are chiefly of earth construction and passable during the dry season. There are few exceptions except within cities.

This new highway construction will open up for commercial exploitation large areas of forest containing rubber, quinine, balsa, and various other commercial woods. The road from Quito to Esmeraldas may open for settlement and cultivation large areas of fertile agricultural, grazing, and forest land, while gold is found in the streams crossed by new highways and on the route of projected roads.



Lincoln Electric Co. Photos

The first and last welds of the $95,000,000 Big-Inch pipeline which will deliver 300,000 barrels of oil a day to the East Coast. Arc welding made possible the speed with which the work was done.

New Regional Offices Of Reclamation Bureau

Decentralization of the Bureau of Reclamation to assure a full utilization of the land and water resources of the West to meet war and post-war requirements was announced recently. The reorganization plan, presented to the Secretary of the Interior by Commissioner of Reclamation Harry W. Bashore, establishes six major field offices headed by local representatives of the Commissioner.

These Regional Directors will be under the direct supervision of the Commissioner, but will have extensive latitude for independent action. Subject to Bureau policies and programs and to direction and assistance in the execution of technical phases, they will be responsible for coordinating all Bureau activities in their respective regions. It is anticipated that this plan, developed by the Bureau under the former Commissioner John C. Page prior to his resignation last June, will bring the Bureau in closer touch with the people affected by its functions, and provide a more thorough understanding of area problems and of the needs and potentialities of each area. To facilitate the Bureau's war and post-war programs, another office of Assistant Commissioner has been established with the appointment of William E. Warne.

The six regions and the Regional Directors who have been appointed are as follows. Region No. 1, with headquarters in Boise, Idaho, includes Washington; Oregon; that part of the Klamath Project in California; Idaho, excluding the Bear River Basin; and the Snake River Basin in Wyoming. Frank A. Banks, Construction Engineer in charge of the Columbia Basin Project, is Regional Director, with R. J. Newell, Construction Engineer in charge of the Boise and Owyhee Projects, Assistant Director. Region No. 2 has its headquarters in Sacramento, Calif., and covers the state of California, excluding the Klamath Project, the watershed of the Lake Tahoe area and the San Diego and Colorado River Projects. Charles E. Carey, Consulting Engineer for the Bureau, is Director, and Robert S. Calland, District Engineer of the Central Valley Project, is Assistant Director.

Boulder City, Nevada, is the headquarters of Region No. 3, which includes the state of Arizona; the San Diego Project in California; and the Colorado River Projects in California, Nevada, and New Mexico. The Director is Ernest A. Moritz, Director of Power, Boulder Canyon Project, and Leo J. Foster, Construction Engineer, All-American Canal and Gila Projects, in Arizona and California, is Assistant Director. Region No. 4, with headquarters in Salt Lake City, Utah, includes Nevada, excluding the Colorado River Projects therein; the Lake Tahoe area watershed; the Bear River Basin in Idaho and Wyoming; and the Colorado River Basin in Wyoming and Colorado, excluding the Colorado-Big Thompson and the Blue River-South Platte Projects. Ernest O. Larson, Construction Engineer for the Provo River Project in Utah, is Director.

Region No. 5 is composed of the States of Colorado and New Mexico, excluding all of the Colorado River Projects, except the Colorado-Big Thompson and the Blue River-South Platte Projects; Texas; Oklahoma; and the Arkansas River Basin in Kansas. Wesley R. Nelson, Chief, Engineering Division, Commissioner's Office, Washington, D. C., is Director, with headquarters in Amarillo, Texas. Region No. 6 includes the states of Montana, North Dakota and South Dakota; Wyoming, excluding the Snake River Basin, the Bear River Basin, and the Green River Basin; Nebraska; and Kansas, excluding the Arkansas River Basin. Harold D. Comstock, Superintendent of the Riverton Project, Wyoming, is the Director, with William G. Sloan, Senior Engineer, Bureau of Reclamation, as Assistant Director.

In addition, the reorganization plan establishes four branches, all located at Denver, under the direct administrative supervision of the Commissioner of Reclamation. These are the Branch of Design and Construction, with Sinclair O. Harper, Chief Engineer of the Bureau, in charge; Branch of Project Investigations, with Erdman B. Debler, as Director; Branch of Operation and Maintenance, with John S. Moore in charge; and Branch of Fiscal and Administrative Management, William F. Kubach, Director.

New Filtration Plant Adds to Water Supply

(*Continued from page 55*)

in diameter was nearly complete, except for the reinforced-concrete roof, at the time of our visit. Because of the number of columns needed to support the roof, the interior of this structure was a forest of lumber during the pouring of columns and beams as well as during the final pouring of the roof slab.

Quantities

The major quantities involved in this $455,260 contract for the filtration plant and pumping station in one structure and the separate clear-water basin were as follows:

Excavation and disposal	20,000 cu. yds.
Timber piles	1,800 ft.
Cast-iron pipe, bell and spigot	180 tons
Cast-iron specials, bell and spigot	40 tons
Cast-iron specials, flanged	50 tons
Gate valves, 12 to 24-inch hydraulic and hand-wheel operated	52
Check valves, 12 to 16-inch	4
Cone valves, 8 to 10-inch	3
Concrete foundation and floors	400 cu. yds.
Concrete walls	1,000 cu. yds.
Concrete slab, beams, columns and baffles	1,200 cu. yds.
Concrete mass, unreinforced	4,000 cu. yds.
Steel reinforcing	400,000 lbs.

Hauling C. I. Specials

The contractor used a very novel hitch for moving the cast-iron specials from a storage yard near the freight spur to the places where they were to be installed. A light wrecker truck equipped with a sheet-metal bumper at the back carried a pipe A-frame and a hand-operated Sasgen winch with a ¼-inch steel cable. A wire-rope sling was run through a single heavy casting and then lifted by the hand winch clear off the ground and carried away by the truck. Two or even three smaller castings were moved by running a 4 x 4 through them and looping the sling over the ends of the timber. The foreman reported that this outfit had been used to lay a 36-inch cast-iron pipe 18 feet long.

Personnel

The contract for the construction of the supplementary filter plant and pumping station with the clear-water basin was awarded to Bass Engineering & Construction Co., of Birmingham, Mich., for whom O. A. McFarlane was Superintendent. The design and supervision of construction were handled by Newsom & Aldrich, Engineer-Consultants, New York, N.Y., and Williamsburg, Va.

Equipment Conservation

The use of Coast Metals hard-facing welding rods to extend the life of equipment parts, and to repair and rebuild, is described in a folder, No. X-201, issued by Coast Metals, Inc., 1232 Camden Ave., Canton, Ohio, from whom copies may be secured by mentioning this item. The folder discusses the properties of these hard-facing rods and contains suggestions for applications to various types of equipment and parts.

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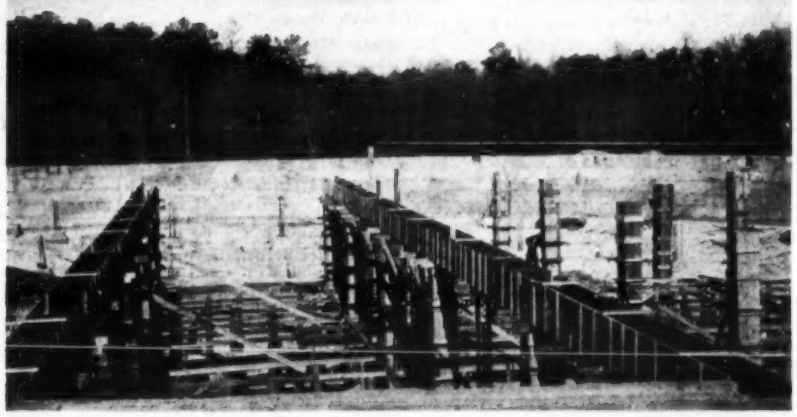
Contractors and Engineers Monthly

The section of the Lafayette By-Pass, Indiana-U. S. 52, where experimental erosion control was begun in 1939. At left, the eroded slopes at the beginning of the work, and, below, the same slopes in the summer of 1943. See page 36.

C. & E. M. Photos



Construction of a supplementary filter plant and clear-water basin at Lee Hall, Va., to provide more water for war needs in the Newport News, Va., area. Top photo, the filter-plant pipe gallery between filters, with the pump station in the background and the coffer for the intake in Lee Hall Reservoir. Lower photo, forms for the roof beams of the 173-foot diameter clear-water basin. See page 55.

The seal of ¼-inch crushed stone used in the heaviest maintenance operation by Franklin County, Ohio. See page 2.

Placing hydraulic fill for the new Idlewild Airport in New York City. Right, the type of shoe used on the discharge line of the dredge Nebraska; lower right, typical discharge from the 30-inch line; below, the shield over the cutter-head motor.

C. & E. M. Photos

C. & E. M. Photo

Not Jonah and the whale; just a mechanic at the Central Equipment Repair Garage of the Wyoming State Highway Department making an adjustment on the engine of a V-8 truck. See page 1.

The standard field office for engineers and testing which Allegheny County, Pennsylvania, requires contractors to provide on its construction projects. The structure, shown at the right, is so designed and built that it can be taken apart, stored, and set up elsewhere. See page 45.